SAN FRANCISCO PUBLIC LIBRARY
3 1223 03588 4775

STATE OF CALIFORNIA

DEPARTMENT OF
CALIFORNIA HIGHWAY PATROL

L12

DOCUMENTS DEPT.
SAN FRANCISCO
PUBLIC LIBRARY

REFERENCE
BOOK

Not to be taken from the Library

IETA EARTHQUAKE
OBER 17, 1989

I - 880
CYPRESS STREET VIADUCT
STRUCTURE COLLAPSE

VOLUME - II

DOCUMENTS DEPT.
OCT 6 - 1994
SAN FRANC O
PUBLIC LIBRARY

FACTUAL DATA

D
REF
625.7042
L837
v.2

SAN FRANCISCO PUBLIC LIBRARY
3 1223 03588 4775

STATE OF CALIFORNIA

DEPARTMENT OF
CALIFORNIA HIGHWAY PATROL

LOMA PRIETA EARTHQUAKE
OCTOBER 17, 1989

I - 880
CYPRESS STREET VIADUCT
STRUCTURE COLLAPSE

VOLUME - II

DOCUMENTS DEPT.
OCT 6 - 1994
SAN FRANCISCO
PUBLIC LIBRARY

FACTUAL DATA

D REF 625.7042 L837
v.2

Loma Prieta earthquake,
October 17, 1989 :
c1990.

The 1989 Loma Prieta Earthquake

Copyright © 1990 by the California Highway Patrol

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the California Highway Patrol.

California Highway Patrol
2555 First Avenue
Sacramento, CA
95818

S.F. PUBLIC LIBRARY

3 1223 03588 4775

INTRODUCTION - VOLUME II

At the direction of M. J. Hannigan, Commissioner of the California Highway Patrol, a special investigation team was established to document the earthquake induced collapse of the portion of the I-880 Nimitz Freeway known as the Cypress Street Viaduct. This special investigation team was officially formed on October 26, 1989, and began operation on October 30, 1989.

PURPOSE

The purpose of the special investigation team was to identify, collect and document factual information relating to the following specific areas:

1. Traffic flow on the Cypress Structure at the time of its collapse.
2. Identification and location of each vehicle on, or adjacent to, the Cypress Structure that was damaged as a consequence of its collapse.
3. To identify the extent of damage to all vehicles and other property directly, or indirectly, associated with the collapse of the Cypress Structure.
4. Identification and location of the drivers and passengers of each of the vehicles identified in item number 2, above.
5. Identification of all parties injured or killed as a direct, or indirect, consequence of the collapse of the Cypress Structure. To include the date, time and cause of death and extent of injuries to each victim identified in item number 4, above.
6. To interview and document the statements of all survivors of the Cypress Structure collapse as identified in items number 4 and 5, above.
7. To identify, locate, interview and document the statements of witness to the collapse of the Cypress Structure.
8. To collect the data necessary to prepare a factual description of the collapse of the Cypress Structure and its effect on the vehicles and their occupants who were on, or adjacent to, the structure when it collapsed.

OBJECTIVE

It is not the intent, nor is it the objective of this report to determine, or address, the cause, or causes, of the collapse of the Cypress Structure. The primary responsibility of this report is to provide for the factual documentation of the evidence related to the collapse of the structure, and to describe, as accurately as possible, the sequence of events taking place just prior to, and during, the structure collapse.

PURPOSE - VOLUME II

The purpose of Volume II is to document the factual information collected by the California Highway Patrol during its investigation of the collapse of the Cypress Street Viaduct. Included is a factual description of the Cypress Street Viaduct and the damage it sustained as a consequence of the 1989 Loma Prieta earthquake. Also included in this volume is the description, and location, of the physical evidence associated with vehicle motion on the Cypress Structure and the surface streets adjacent to the structure. This volume also catalogues the photographs, video tapes and audio cassette tapes produced, or collected by the Department during its investigation. Not included in this volume is the factual information relating to vehicle damage or the injuries sustained by involved parties. This information has been reported in Volume I, Identification, Damage and Injury Summaries. This is the second volume of a six volume set.

VOLUME II

FACTUAL DATA

TABLE OF CONTENTS

TITLE PAGE NUMBER

COMMONLY USED ABBREVIATIONS AND TERMS........................ii to iii

BENT LEGEND DIAGRAM..iv

SEISMIC DATA...II-1 to II-3

WEATHER...II-3

ENGINEERING REPORT.......................................II-5 to II-103

Roadway - Structure Description..........................II-5 to II-15

Structure Damage Description.............................II-17 to II-103

Figures..II-105 to II-108

PHYSICAL EVIDENCE DESCRIPTION AND LOCATION...............II-109 to II-115

PHOTO LOG..II-117 to II-136

VIDEO TAPE LOG...II-137 to II-144

AUDIO TAPE LOG...II-145 to II-149

Digitized by the Internet Archive
in 2014

https://archive.org/details/lomaprietaearth1990cali_1

COMMONLY USED TERMS
AND
ABBREVIATIONS

Abbreviations

Caltrans - California Department of Transportation
CHP - California Highway Patrol
CSMIP - California Strong Motion Instrumentation Program
E/B - Eastbound
fps - Feet per second
fps/s - Feet per second per second
ft - Feet
mph - Miles per hour
OPD - Oakland Police Department
P/U - Pick up
S/B - Southbound
S.O. - Sheriff's Office
Sec - Second
N/B - Northbound
T/L - Traffic Lane
USGS - United States Geological Survey
W/B - Westbound

Terms

Bent: A roadway support structure which consists of rectangular horizontal members (caps) and rectangular vertical members (columns). Bents on the Cypress Structure were given numbers corresponding to their respective bent number on the Caltrans "as-built" plans.

Cable Restrainers: Cable and fastener devices designed to prevent an expansion joint from pulling apart in the longitudinal direction.

Cap: A rectangular horizontal support member, consisting of concrete and reinforcing steel, which is attached to columns.

Column: A rectangular vertical support member, consisting of concrete and reinforcing steel, which is attached to, and supports, the caps.

Diaphragm: A horizontal girder which forms the north face of a support span, or the south face of an overhang span.

Expansion Joint: A stepped, overlapping connection that allows for thermal expansion of the roadway structure. Also known as a Hinge.

Exterior Girders: The girders on the outside of a span.

Girders: A rectangular support member, consisting of concrete and steel, which runs longitudinally along the span and attaches to the caps.

Horizontal Steel: Reinforcing steel contained in a horizontal support member.

Interior Girders: The girders on the inside of a span.

Longitudinal Steel: Reinforcing steel contained in a longitudinal support member.

Overhang Span: The portion of a span north of an expansion joint, which is supported by the support span.

Roadway Surface: A span's top slab of asphalt and concrete, which is attached to the girders and caps.

Soffit: The bottom slab of concrete in a span, which is attached to the girders and the caps.

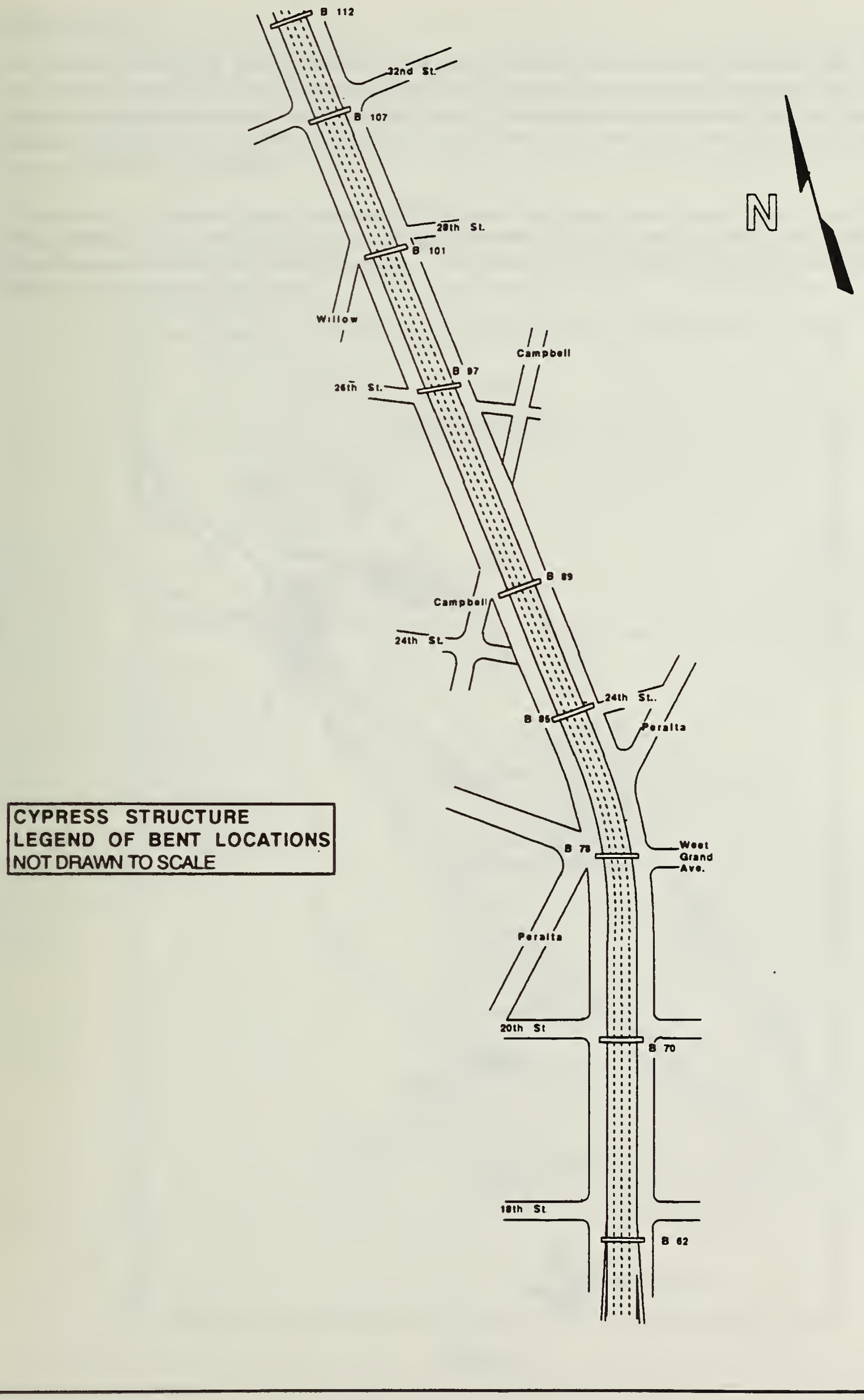
Span: A section of the roadway structure between bents, which is connected to the top portion of a cap. Spans on the Cypress Structure were given numbers corresponding to the number of the bent immediately to their south. As an example, Span 63 would be the span north of Bent 63 and south of Bent 64.

Strong Motion: As used in this investigation report, strong motion refers to earthquake induced ground, or structure, motion that is strong enough to be felt by the occupants of a vehicle.

Support Span: The portion of a span, south of an expansion joint, which is designed to provide support for an overhang span.

Vertical Steel: Reinforcing steel contained in a vertical support member.

I-880 CYPRESS STRUCTURE COLLAPSE - BENT LEGEND



CYPRESS STRUCTURE
LEGEND OF BENT LOCATIONS
NOT DRAWN TO SCALE

SEISMIC DATA

On October 17th, 1989, at approximately 5:04 pm, an earthquake shook northern California. The earthquake measured 7.1 on the Richter Scale and was located along the San Andreas fault in the Santa Cruz Mountains, northeast of the city of Santa Cruz. The earthquake was felt as far away as Reno and Las Vegas, Nevada and Los Angeles, California, and was the largest magnitude earthquake centered in northern California since 1906.

The epicenter of this earthquake, called the 1989 Loma Prieta earthquake, was located approximately 10 miles northeast of the city of Santa Cruz and approximately 20.5 miles south of San Jose, in the Santa Cruz Mountains, near Loma Prieta Mountain. The Cypress Street Viaduct is located approximately 61 miles to the north of this epicenter.

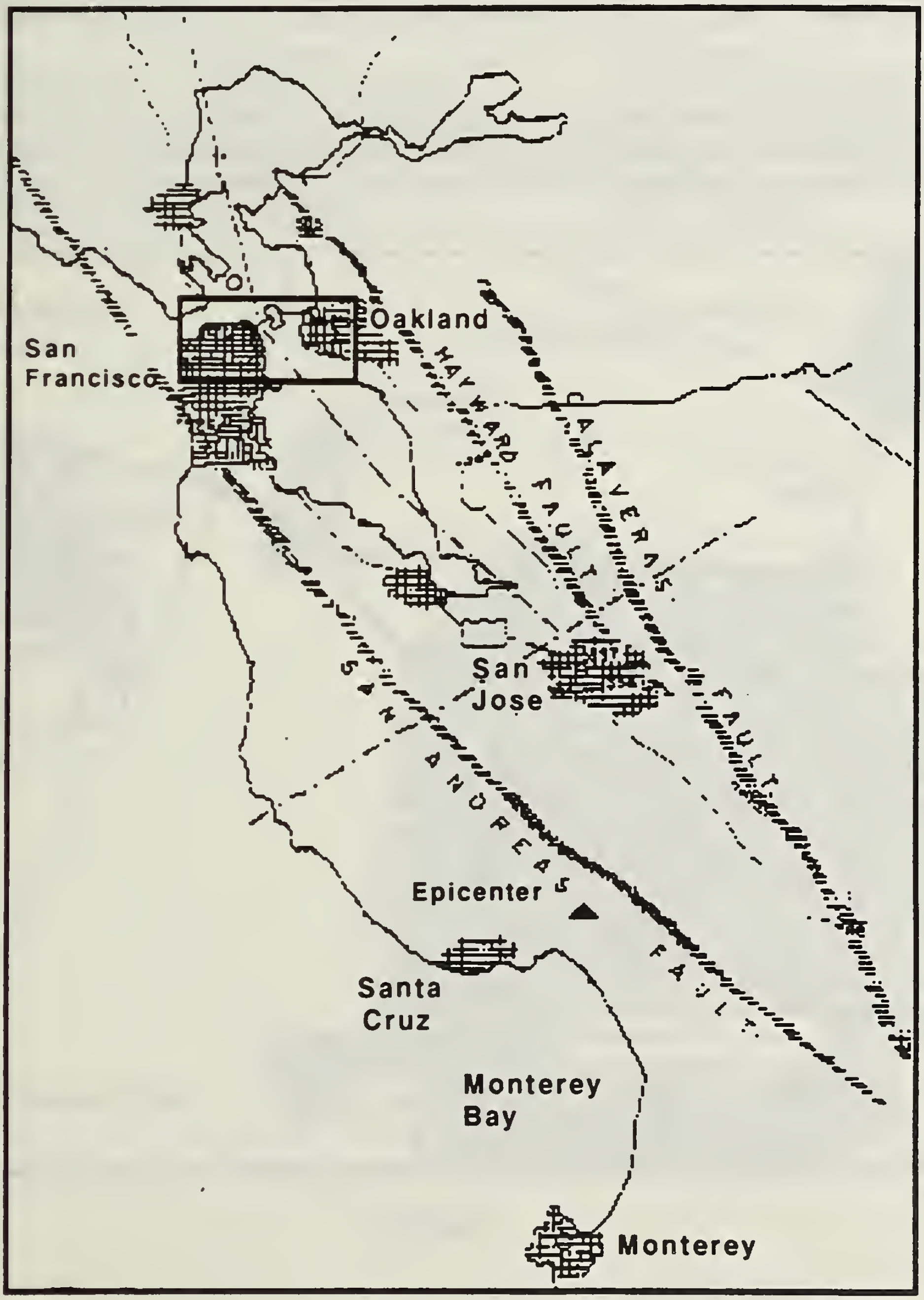


Figure -1

The focus of the earthquake, or depth below the surface of the earth, was approximately 11.5 miles, which is deeper than most earthquakes occurring on the San Andreas fault zone in this region. The duration of the strong ground motion for this earthquake was less than 10 seconds, in most areas of interest.

There were several strong-motion seismic recording stations located near the Cypress Structure. The results from these recording stations are given in reports by the Department of Conservation, Division of Mines and Geology, and the Department of the Interior, United States Geological Survey (USGS).

The California Strong Motion Instrumentation Program (CSMIP), station 58472, is located in Oakland, on the outer Oakland Wharf, approximately 1.2 miles west of the Cypress Structure. This station measured peak ground accelerations of 0.29g in the horizontal direction and 0.07g in the vertical direction. CSMIP station 58224 is also located in Oakland, in the Lake Merritt district, approximately 1.2 miles east of the Cypress Structure. This station measured a peak horizontal acceleration of 0.25g and peak vertical acceleration of 0.16g.

A USGS seismic recording station was located in Emeryville, at a 30-story structure on Christie Avenue. This is approximately 1.2 miles north of West Grand Avenue and the Cypress Structure. The ground sensors at this station registered peak accelerations of 0.26g in the horizontal direction and 0.06 in the vertical direction.

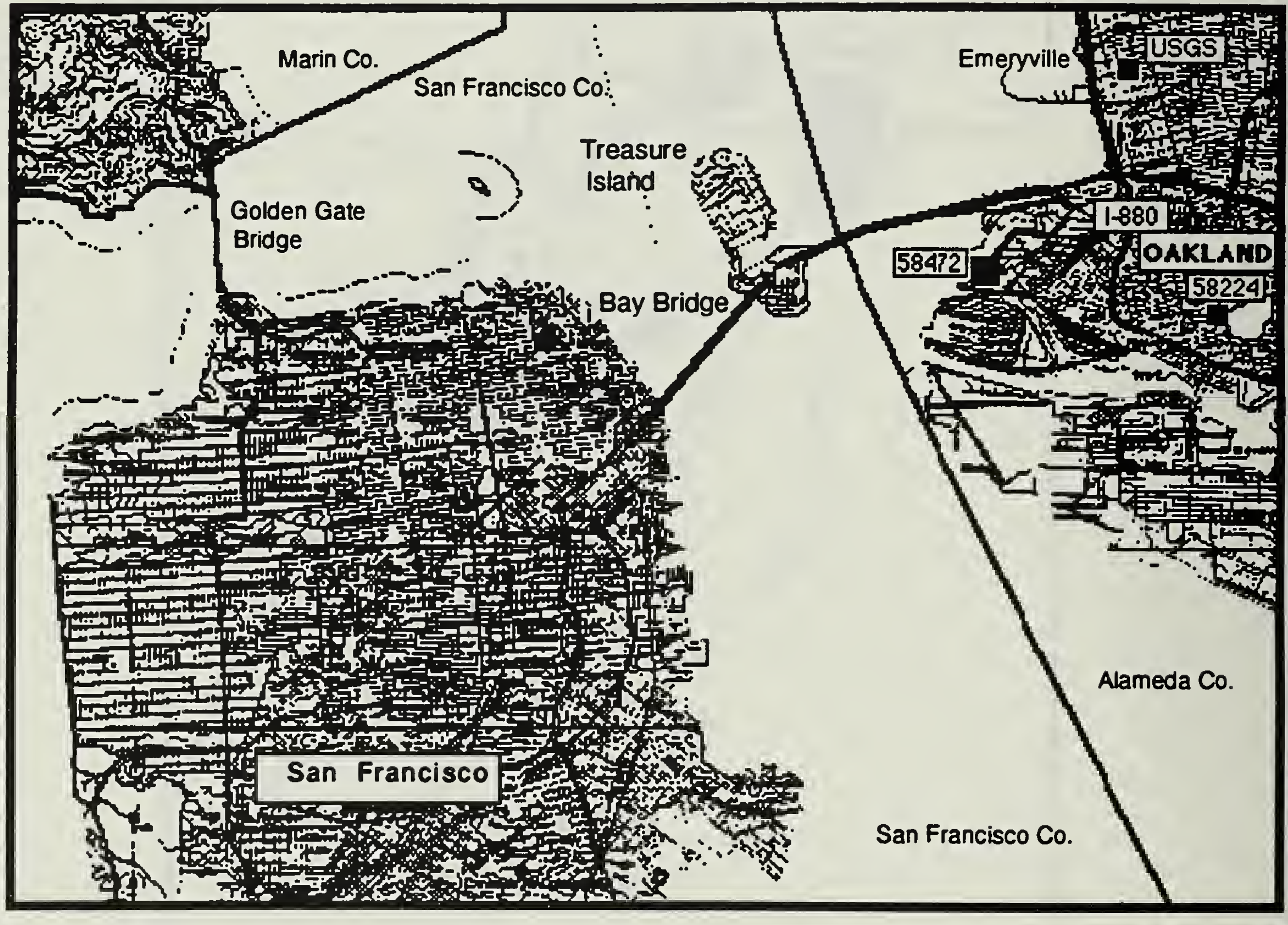


Figure - 2

Displacement-time histories computed by the California Department of Conservation, Division of Mines and Geology, suggest a peak ground displacement of over 3.5 inches in the east-west direction and approximately 1.7 inches in a north-south direction in the area adjacent to the Cypress Street Viaduct. As the CSMIP stations used to develop these displacement-time histories were adjacent to the Cypress Structure, it is quite possible that similar ground displacements were experienced there as well.

WEATHER

The following Weather conditions for the 17th of October were provided by the National Weather Service.

	San Francisco International Airport	Oakland International Airport
Time:	1750 hours	1745 hours
Temperature (F):	73 Degrees Fahrenheit	79 Degrees Fahrenheit
Dew point:	45	53
Wind:	13 Knots from the N/W	11 Knots from the N/W
Visibility:	8 miles	11 miles
Barometric Pressure:	29.97 millibars	29.97 millibars

ENGINEERING REPORT

INTRODUCTION

Interstate 880 is a north-south connector freeway in the San Francisco Bay area, which runs from the Junction of Route 280, Steven Creek Boulevard Interchange in Santa Clara County, to the Alameda County junction of Route 80 in Oakland. This facility provides access for East Bay communities to the city of San Francisco via the San Francisco-Oakland Bay Bridge in the north; South Peninsula communities access via San Mateo and Dunbarton bridges; and San Jose and Central California communities access via its southern connections. The portion of I-880 covered in this investigation is called the Cypress Street Viaduct and is located in the city of Oakland. The Cypress Street Viaduct is a bi-level, conventionally reinforced, portland cement concrete structure constructed so that the southbound roadway is located directly above the northbound roadway. The area land use on both sides of the highway at this location is mixed industrial/commercial, with some urban residential. On October 17, 1989, at 1704 hours, an earthquake with a measured magnitude of 7.1 on the Richter scale caused the collapse of a portion of this structure.

SCENE IDENTIFICATION

The collapsed portion of the Cypress Street Viaduct was located between 16th Street and 34th Street in the city of Oakland. The impacted area lies between column support assembly (Bent) numbers 62 and 113 inclusive. This portion of I-880 is approximately 3/4 of a mile in length and runs from the southwest to the northeast, and is located between Postmile 33.3 and 34.0 in Alameda County.

ROADWAY DESCRIPTION

Roadway Description

The collapsed sections of the Viaduct was an eight lane urban expressway with four lanes of travel for both northbound and southbound traffic. The roadway generally consisted of twelve (12) foot travel lanes, one (1) foot paved shoulders and two foot, six inch (2′-6") concrete parapets with raised walkways and tubular hand railings.

Roadway Cross Slope

The roadway cross slope was superelevated to the east and varied from 1 to 5 % with the horizontal alignment.

Horizontal Roadway Alignment

The horizontal alignment of the roadway was; tangent from Bents (column support assemblies) 62 to 74, a 2000′ radius curve (left) from Bents 74 to 80, and tangent from Bents 80 to 107. At Bent 106 the roadway alignment differed from the upper to lower deck. The upper deck had a 2300′ radius curve (left) from Bents 106 through 113 while the lower deck had a 2600′ radius curve (left) from Bents 107 through 113.

Vertical Roadway Alignment

The profile grade, proceeding northward, varied from the upper to lower roadways.

The upper deck, at column support assembly (Bent) #62, was on a 600 foot crest vertical curve. At Bent 72, it made a transition to a -0.992 slope which continued to Bent 78. At Bent 78, it made a transition to a 260 foot sag vertical curve which continued to Bent 82, where it made a transition into a 250 foot sag vertical curve that turned upward towards Bent 85. At Bent 85, the upper deck profile began a 1600 foot crest vertical curve which made a transition downward as it approached Bent 101. Profile data past this point was unavailable, however, from "As Built" plans supplied by Caltrans, it was determined that the profile grade of the upper deck continued on a negative slope (downward) through Bent 113.

The lower deck at Bent 62 was on an 800 foot crest vertical curve. At Bent 75, it made a transition to a -1.64 slope which continued to Bent 76. At Bent 76, it made a transition to a 700 foot sag vertical curve that turned upward as it approached Bent 85. At Bent 85, the deck made a transition to a 1600 foot crest vertical curve which made a downward sweep as it approached Bent 101. Profile data past this point was unavailable, however, the "As Built" plans indicate that the roadway continued on a negative slope to Abutment 112 where the roadway continued to ground level.

Sight Distance

The sight distance in both directions of travel was adequate for roadway conditions.

Pavement Description

The condition of the roadway surfaces was generally good.

Pavement markings on the structure were similar between the upper and lower roadways. Lane delineation consisted of Type A (White Non-reflective) pavement markers (Botts Dots) in groups of four interspersed with Type G (One-way Clear Reflective) square markers. This application conformed to Detail 13 - Lanelines (Multilane-Highways), on the Pavement Markers And Traffic Lines Typical Details Sheet A20-A, of the Department Of Transportation, Standard Plans, dated January 1988. The left shoulder was delineated with a 4 inch yellow line and Type H (One-way Yellow Reflective) pavement markers, conforming to Detail 25, and the right shoulder was delineated with a 4 inch white line, conforming to Detail 27A, of Sheet A-20B, of the 1988 Standard Plans.

SPEED LIMIT

The speed limit for the Cypress Street Viaduct was posted at 55 MPH.

TRAFFIC VOLUMES

The Annual Average Daily Traffic Volume on the Cypress Street Viaduct between the 14th and 32nd Street Connections was 171,000 vehicles per day.

The peak hourly volume was 15,400 vehicles per hour. These are total volumes in both directions of travel for 1988 as shown in the Caltrans "1988 Traffic Volumes on California Highways" booklet.

The best estimate of normal traffic volumes at the time of the earthquake was obtained from a Caltrans traffic count conducted during the period of January 26 to January 30, 1987, on the lower deck of the structure (northbound) at 32nd Street, PM 34.121. The 15 minute volume recorded at 1700 hours on Tuesday, January 26th, was 447. Based on information provided by Caltrans District 4, the traffic flow for a typical Tuesday in October at 1700 hours would be approximately 1509 vehicles per hour per lane for southbound and 1400 vehicles per hour per lane for northbound traffic.

STRUCTURE DESCRIPTION

Introduction

The Cypress Street Viaduct is a conventionally reinforced, portland cement concrete, box girder design conforming to American Association of State Highway Officials (A.A.S.H.O.) and California Division of Highways specifications in effect on August 1954. The collapsed portion was typically a bi-level structure, with 52 foot wide upper and lower roadbeds, supported by conventionally reinforced rectangular concrete columns, variably spaced from 68 feet to 90 feet on centers.

The basic structure of the Cypress Street Viaduct changed configuration over 19 times, along the collapsed portion, from 18th to 34th Streets. An examination of the As Built Plans dated July 26, 1957, indicates that these design changes were the result of variations in the roadway alignment and span length, as well as plans for future construction proposed at the time which would have connected with the west side of the Cypress structure in the general area of West Grand Avenue.

This section will provide a noninclusive description of the collapsed portions of the viaduct structure as well as the portions to the immediate north and south, which remained standing between 16th and 34th Streets.

Definitions

In order to accurately document the structure's configuration and describe the damage it sustained due to the earthquake, it was necessary to use technical terms. Basic definitions for these terms, as they apply to the I-880 structure, are provided below.

Bent

A roadway support unit, normally perpendicular to the path of travel, consisting of rectangular horizontal members (Caps) supported by vertical members (Columns). Each roadway section attaches to the top portion of its bent cap. Lateral direction is designated by the terms "left" and "right", and is established by positioning the reference point at the roadway centerline facing the direction of increasing Bent numbers. Bents on the Cypress Structure were numbered sequentially from the south toward the north using the station numbers from the Caltrans "As-Built" plans. (Figure E-2)

Dowels

Four, 4-foot long vertical reinforcing steel bars extending through a pinned connection joint, designed to prevent lateral translation

Exterior Girder

The outside, vertical face of a span. (Figure E-2, Page II-105)

Fixed Connection

A method of attachment designed to resist rotation and shear. The concrete columns with this type of connection had continuous vertical reinforcement through the connection point. (Figure E-4, Page II-106)

Hinge

A stepped cut through a span to permit thermal expansion. Hinges were located at the 1/4 point north of the bent, along the span, with upper roadway hinges aligned over the lower roadway hinge. A hinge is also known as an expansion joint, or expansion hinge. (Figure E-3, Page II-105)

Keyway

A 1'-8" x 3'-0" x 2 5/8" depressed section of concrete located between pinned connection joints. Keyways are designed to resist lateral translation.

Mat of Steel

A group of reinforcing steel bars tied together in a unit

Overhang Span

The portion of a span, north of a hinge. (Figure E-2, Page II-105)

Pinned Connection

A method of attachment designed to resist shear only. The concrete columns with this type of connection had a keyed joint with vertical dowels extending through the connection point. (Figure E-4, Page II-106)

Soffit

The bottom slab of a roadway span section. (Figure E-1, Page II-105)

Spall

A surface fractured section of concrete normally caused by compressive forces. To chip, splinter, or break into smaller pieces.

Span

A section of roadway between bent supports. This structure had two separate roadways, one above the other, which constitutes one span. The spans are rigidly attached to their support system, so as to be continuous. The numbering system follows the bent numbering system. For example, Span 60 lies between Bents 60 and 61. (Figure E-2, Page II-105)

Support Span

The portion of a span south of a hinge, and designed to provide one of the support points for an overhang span. (Figure E-2, Page II-105)

Translation

To move from one position to another position.

Structure Description - By Bents and Spans

Bent 60

The lower deck was centered on, and supported by, a three column system with fixed connections at its cap. These columns rested on pile supported footings. The upper deck was offset to the left, overhanging its left column. The upper left column had a fixed connection at the lower deck cap and a pinned connection at the upper cap. The upper right column was pinned at both the upper and lower connections. The upper deck cap was extended to align over the right columns. The roadway was approximately 65 feet wide at this location to accommodate ramps which connected to both decks, which narrowed as they progressed northward. The upper and lower deck spans were hinged in Span 59, with the overhang spans connecting to this bent. (Figure E-4)

Span 60

This was a 68 foot long span.

Bent 61

The lower deck supports were similar to Bent 60. The lower deck was centered on the Cap. The upper deck was offset, overhanging its cap to the left. The upper cap was extended to align over the right columns. The upper deck columns were similar to Bent 60. Alignment offset between the roadways was decreased as it progressed ahead. The roadway width was approximately 61 feet at this location, and continued to narrow.

Span 61

This was a 68 foot long span.

Bent 62

The lower deck was supported by two six foot by four foot columns and a central four foot by four foot column, similar to Bent 60. The lower deck was centered on the Cap. The upper deck was offset left. The alignment offset between the upper and lower roadways continued to decrease. The upper cap was extended to align over the right columns. The left edge of the upper deck aligned over the left column assembly at this location. The upper deck columns were four foot wide at their tops and three foot at their bases (the top of the lower deck rail). These columns had fixed connections at their bases and pinned connections at the upper cap. The upper roadway width was approximately 56 feet, and the lower roadway width was approximately 59 feet at this location and continued to narrow.

Span 62

This was a 68 foot long span with expansion hinges. The support span attached to Bent 62 and the overhang span attached to Bent 63.

Bent 63

The lower deck was supported by a two, six foot by four foot, column system with fixed connections at the bent cap and pinned connections at the pile supported footings. The lower deck was centered on the cap. The upper deck was offset left approximately 1.5 feet. The upper cap was extended to align over the right columns. The upper deck columns were four foot wide and had fixed connections at the bent cap, and were three foot wide and had pinned connections at their bases (the top of the lower deck rail). The upper roadway width was approximately 54.5 feet and the lower roadway width was approximately 55.7 feet, and both continued to narrow.

Span 63

This was an 84 foot long span.

Bent 64

The upper and lower decks were supported by a two, six foot by four foot, column system with fixed connections at the bent caps and pinned connections at the column bases. Upper deck columns rested on the lower cap with the pinned connection level with the top of the parapet railing, approximately two foot three inches above the roadway surface. The upper columns were four foot wide at the top and three foot wide at the base. The lower deck columns rested on pile supported footings. Both decks were centered on their caps with roadway widths of approximately 52.1 feet. This bent configuration was standard for 27 of the bents within the limits of the collapse. (Figure E-5, Page II-106)

Spans 64 to 70

These were 79 foot long spans. Expansion hinges were located in Spans 65 and 68 at the first quarter points.

Bents 65 to 69

These bents were similar to Bent 64.

Bent 70

The lower deck supports were similar to Bent 64. The upper deck columns were three foot three inches wide at their bases and had fixed connections, and were four foot three inches wide at the cap and had pinned connections. Both roadways were centered on their caps and maintained a constant 52.1 foot width.

Bent 71

Lower deck supports were similar to Bent 64. The upper deck columns were three foot six inches wide at their bases and four foot six inches wide at the upper cap. The columns had pinned connections at the cap, the left column had a pinned connection located at roadway level (base of the rail) and the lower connection of the right column was fixed. Roadway alignment and widths were similar to Bent 70.

Span 71

This was an 80 foot long span with expansion hinges. The support span attached to Bent 71, and the overhang span attached to Bent 72.

Bent 72

This bent was similar to Bent 71 with upper column widths of four foot nine inches at the cap and three foot nine inches at the bases.

Span 72

This was a 90 foot long span.

Bent 73

The lower roadway was supported by a two column system with fixed connections at the cap and pinned connections at the pile supported footings. The lower cap was extended over the right column, with an overhang of approximately eleven feet. The upper deck and cap aligned over the lower cap. The upper deck columns had pinned connections at the upper cap. The left column base had a pinned connection located at the lower roadway level. The right column had a fixed connection at its base. The upper deck columns were five foot wide at the cap connections and four foot wide at the top of the lower deck rail. The roadway widths remained constant at approximately 52.1 feet.

Spans 73 to 75

These were 80 foot long spans. Span 74 was hinged with the support span attached to Bent 74, and the overhang span attached to Bent 75.

Bent 74

This bent was similar in configuration to Bent 73, with the overhang of the lower cap over the right column reduced to six foot five inches. The roadway slope began a rise to the right as it made a left turn.

Bents 75 to 77

These bents were similar to Bent 71, with upper column widths of five foot at the tops and four foot at the bases. The roadway cross slope continued to increase.

Span 76

This was a 79 foot long span.

Span 77

This was a 72 foot long span with expansion hinges. The support spans attached to Bent 77, and the overhang spans attached to Bent 88.

Bent 78

This bent was similar to Bent 77. The cross slope reached a maximum at this bent. This bent was located in the median of West Grand Ave., and was skewed to match the roadway's alignment.

Span 78

This was a 74 foot long span.

Bents 79 and 80

These bents were similar to Bent 77. The roadway cross slope decreased as the alignment made a transition from curve to tangent.

Spans 79 to 82

These were 77 foot long spans with an expansion hinge in Span 80.

Bent 81

This bent was similar to Bent 64, with upper column widths increased to four foot nine inches at the tops and three foot nine inches at the bases.

Bents 82 to 94

These bents were similar to Bent 64.

Span 83

This was a 75 foot long hinged span with the support span attached to Bent 83, and the overhang span attached to Bent 84.

Span 84

This was an 81 foot long span.

Spans 85 to 93

These were 75 foot long spans. Expansion hinges were located in Spans 86, 89, and 92.

Span 94

This was a 74 foot long span.

Bents 95 to 98

At these bents, the lower roadway was supported by a three column system similar to Bent 60. The upper and lower decks aligned over each other and were offset right on their caps due to the bent's skew. The upper deck's columns had pinned connections at the cap, and fixed connections at the bases, with column widths of four foot and three foot respectively. The bents were skewed forward with the left column located ahead of the right column. This was done to match the alignment of Twenty-sixth Street, which runs between Bents 96 and 97. The roadway width remained constant through this location.

Span 95

This was a 74 foot hinged span with the support span attached to Bent 95, and the overhang span attached to Bent 96.

Span 96

This was an 80 foot long span.

Span 97

This was an 83 foot long span.

Span 98

This was an 83 foot long span with an expansion hinge. The support span attached to Bent 98, and the overhang span attached to Bent 99. The expansion hinge was skewed northward.

Bents 99 to 106

These bents were similar to Bent 64.

Span 99 and 100

These were 83 foot long spans.

Span 101

This was an 84 foot long hinged span with the support span attached to Bent 101, and the overhang span attached to Bent 102.

Span 102

This was a 74 foot long span.

Span 103 to 105

These were 75 foot long spans. Span 104 contained an expansion hinge. The support span attached to Bent 104, and the overhang span attached to Bent 105.

Span 106

This was a 74 foot long hinged span. The support span attached to Bent 106, and the overhang span attached to Bent 107.

Bent 107 and 108

The lower roadway was supported by a two column system similar to Bent 64. These columns began shortening in length as the lower roadway started dropping down to ground level at this location. The upper deck was supported by a two column system similar to Bent 64. The roadway began a transition into a left horizontal curve at Bent 107, and the alignment between the upper and lower roadways began an increasing offset. The upper roadway made a transition into a tighter radius horizontal curve and was offset to the left of the lower roadway. The roadway width remained constant, and the cross slope began to increase (rising to the right).

Span 107

This was an 83 foot long span.

Span 108

This was a 79 foot long span.

Bent 109

The lower roadway was centered on, and supported by, a three column system which continued to shorten as it approached ground level. (Figure E-6, Page II-107). The upper roadway was supported by a two column system similar to Bent 64. The upper deck was offset to the left of its cap and began to overhang the left column. The upper cap was extended to align over the right columns. The roadway widths remained constant, and the offset between the upper and lower roadways continued to increase.

Span 109

This was an 80 foot long span with an expansion hinge. The support span was attached to Bent 109, and the overhang span was attached to Bent 110.

Bent 110 and 111

The upper and lower deck supports were similar to Bent 109. The upper deck offset, over the left columns, continued to increase, and the upper cap overhung the columns with a tapered extension. (Figure E-7, Page II-107)

Span 110

This was a 79 foot long span.

Span 111

This was an 82 foot long span.

Bent 112/Abutment 112

There was a two column system supporting the upper roadway, with fixed connections at the cap and hinged connections on the pile supported footings. The cap was extended to the right so its column aligned with the edge of the lower roadway. The roadway extended over the left column, similar to Bent 111. The cap overhang of the left column continued to increase. The left column was five foot three inches wide at the top and four foot three inches wide at the base (top of lower roadway parapet rail). The right column was four foot three inches wide at the top and three foot three inches wide at the top of the lower rail. The lower roadway reached ground level at this location and was supported by an abutment constructed from reinforced portland cement concrete. (Figure E-8, Page II-108)

Span 112

The lower roadway was at ground level at this location. The upper roadway was an 85 foot long hinged span. The support span attached to Bent 112, and the overhang span attached to Bent 113.

Bent 113

This bent was similar to Bent 112. The lower roadway was no longer part of the structure at this location. The width of the left column was six foot at the top and five foot at the base. The width of the right column was four foot at the top and three foot at the base (top of lower roadway rail). The roadway overhang of the left column continued to increase.

STRUCTURE DAMAGE DESCRIPTION

Introduction

The intent of this portion of the investigation is to provide a general description of the damage sustained by the collapsed section of the Cypress Street Viaduct. The descriptive terms used (minor, moderate, extensive, etc.) are relative to each other, ranking damage at one location as compared to other damaged areas. An effort was made to record the visible damage, with emphasis on documenting the movement of the structure from its constructed position to its at rest position after the earthquake.

This damage description was prepared from the following reference sources: Photographs taken by Valley Division MAIT on October 20, 1989; video tapes taken by Caltrans on October 18, 1989; video tapes taken by Golden Gate Division MAIT on October 27, 28, and 30, 1989; and a visual inspection conducted between October 27 and 30, 1989.

Damage Survey

Bent 60

The bent was intact, but sustained minor cracking and spalls at the junction of the upper and lower columns, with cracks extending into the lower bent cap

Span 60

The span was intact with no noticeable damage.

Bent 61

The bent was intact, but sustained light cracking at the junction of the lower bent cap and column on the east side.

Span 61

The span was intact with no noticeable damage.

Bent 62

The bent was intact, but had cracking and spalled concrete, with exposed reinforcing steel, on the outside face of the lower east column level with the soffit. The cracks extended vertically upward at a 45 degree angle from the junction of the outside lower column and bottom of the bent cap to the inside (west) face of the upper column base at the lower deck level.

Span 62

The UPPER SPAN was separated at the hinge. The support span was in place and the overhang span was resting on the lower roadway. The support span bearing seat appeared to be undamaged. The cable restrainers on the east and west sides of the span were pulled through the overhang span hinge diaphragm and remained attached to the support span. The central restrainer had severed cables and remained within the superstructure. The overhang span had translated both northward and westward. The westward shift was estimated to be between approximately three (3) and four (4) feet. Damage to overhang hinge seat was extensive on the east and west sides, where the restrainers pulled through. The damage at these locations extended into the upper deck. The damage to the center portion of the overhang hinge was light. Damage to the east side of the overhang span was moderate to major. The damage to the west side of the overhang span was major, with half of the exterior girder broken away and hanging over the side of the lower roadway, but attached by its exposed reinforcing steel.

The LOWER SPAN was intact with minor cracks at the hinge. There was light to moderate cracking in the exterior girder on the west side at Bent 63, with the cracks extending to approximately 10 feet south of the bent, and running diagonally up and southward.

Bent 63

East Side

The UPPER COLUMN was severed at the top, below the base, and it had slipped down along the side of the lower column. The column base was resting on the ground and the top was resting on the side of the lower column. The upper column appeared slightly south of the lower column. There was extensive fracture to the top half of the column, exposing the longitudinal reinforcement. This exposed steel was generally straight and surrounded the fractured rubble of the column core. There was extensive spalling, with exposed reinforcing steel at the base of the column, directly above the horizontal joint at the pinned connection. The column was severed below this joint and the vertical dowels, and fractured portions of the keyway concrete, were attached and visible.

The LOWER COLUMN was intact, but had fractures to its top, and the exterior mat of vertical steel was pulled away from the column face.

The UPPER CAP was resting in the lower roadway. The visible portions of the cap were moderately fractured. The upper cap was aligned longitudinally over the lower cap.

The UPPER DECK line sloped upward to the north, as is crossed the cap.

The LOWER CAP, at approximately the east 1/4 point, sustained extensive cracking and spalling, with the lower mat of cap reinforcement exposed. The cap deflected downward approximately one (1) to two (2) inches at this location. On the east side, there was moderate cracking, which ran upward and westward at approximately 45 degrees, starting at the junction with the column.

West Side

The UPPER COLUMN separated from the structure at the pinned connection at its base and collapsed, but remained attached to the upper bent cap. The break at the column base was along the horizontal joint line, with the vertical dowels and fractured keyway concrete remaining attached to the column. There was minor to moderate spalls along the column base at the pinned connection, and light to moderate longitudinal cracking from base to top, midway between the east and west face. The column top had extensive fracture at the cap exposing the longitudinal reinforcement. The column had a northward lean, from bottom to top, with the very top part separated from the rest of the column and shifted slightly southward.

The LOWER COLUMN was intact, with fractures to the top. A portion of the exterior (west) vertical reinforcement had been ripped out and peeled outward from the column top to approximately 1/3 of the way down its length.

The UPPER CAP was resting on the lower roadway, and had moderate to major fracture extending into the cap from the column connection area. The estimated cap shift was approximately three (3) to four (4) feet westward and approximately 1/4 to one (1) foot northward.

The LOWER CAP had minor cracks and spalls at the junction with the lower column on the west side. The central portion of the cap was undamaged.

Span 63

East Side

The UPPER SPAN sustained moderate to major damage with a breakup of the exterior girder, and collapse of the central portion of the span, resulting in a sag in the deck line. The upper span rested on top of the lower deck. The exterior girder was fractured at the Bent 64 cap.

The LOWER SPAN had fractured concrete at the junction of the soffit and exterior girder at approximately the 1/3 points. These fractured areas aligned under the break points of the upper exterior girder at the beginning of the upper span sag.

West Side

The UPPER SPAN sustained moderate to major damage and was resting on top of the lower deck parapet railing. The lateral shift of the upper span decreased from approximately four (4) feet to two (2) feet, westward, as the span proceeded to Bent 64. The exterior girder was torn away from the upper deck approximately 10 feet north of the bent cap and there was extensive fracture propagating into the top deck. The tear was approximately 10 feet long, the upper deck collapsed along the tear, and the north section of the girder had under ridden the section which remained attached to the cap. The exterior girder overlapped the lower span railing from the beginning of the tear to about mid span. There was another cracked area in the exterior girder approximately eight (8) feet from Bent 64. The crack was wider at the bottom and closed as it approached the top of the girder. There was fractured concrete and exposed reinforcement at the soffit.

The LOWER SPAN was intact, but sustained light to moderate diagonal cracking in the exterior girder and spalled concrete at the soffit-girder interface at approximately the 1/4 and 3/4 points. The diagonal cracks aligned under the fractured areas in the upper exterior girder and sloped towards the center of the span as they rose from the bottom of the girder. There was contact damage to the parapet railing, at mid span, which aligned over the tear in the upper exterior girder.

The UPPER DECK ROADWAY surface sustained major fractures and damage. It ramped upward across the bent cap approximately 3.7 feet over a horizontal distance of approximately seven (7) feet.

Bent 64

East side

The UPPER COLUMN severed at the top, and base, and fell away. The column was removed prior to this investigation. The column fell to the south of the cap.

The LOWER COLUMN was intact but had fractures to the top, and the exterior mat of vertical reinforcing steel was pulled away from the east face approximately 1/4 of the way down its length. The steel was generally bent out and down, with the southernmost bar bent out, slightly up, and southward.

The UPPER CAP was resting on the lower deck, and the spans on each side collapsed so as to create a hump over the cap. The cap aligned longitudinally over the lower cap, but was shifted laterally to the west. The very top portion of the upper column, and one of the longitudinal reinforcing steel bars from both the north and south sides of the column, remained attached to the cap.

At approximately 3.5 feet from the east column, the LOWER CAP sustained more extensive damage and appeared to have partially failed, deflecting slightly downward, and partially exposing the bottom mat of cap steel. There was light cracking and spalled concrete at the junction with the east column.

West side

The UPPER COLUMN was severed at its base and had collapsed, but remained attached to the upper cap. The column was slightly tilted, the base had shifted to the north, and the top had shifted to the south. The base of the column severed at the horizontal joint, and the vertical dowels and fractured portions of the keyway concrete were attached and visible. There were fractures to the inside of the top part of the column, where it had contacted the top part of the lower cap and parapet railing.

The LOWER COLUMN was intact, but the exterior mat of reinforcing steel had been pulled away from the west face approximately 1/4 of the way down from the top. This steel surrounded the north and south sides of the upper column.

The UPPER CAP was resting on the lower deck and was shifted slightly south of the lower cap. There was fractured concrete and a slight separation of the upper column where it joined with the cap.

The LOWER CAP had sustained light to moderate cracking and spalls at the junction of the west column. There was light cracking evident along the west-central portion of the cap.

Span 64

East side

Damage to the UPPER SPAN was moderate, with diagonal cracking along the exterior girder, and extensive girder fracture at the bent cap. The span collapsed on to the lower deck at the bent, and sloped upward rising off the lower deck as it proceeded to Bent 65.

The LOWER SPAN was intact with no noticeable damage.

West side

The UPPER SPAN had light to moderate damage. It shifted westward approximately two (2) to three (3) feet, and was resting on top of the lower parapet railing. There was moderate exterior girder fracture at the bent cap, which extended northward approximately 10 feet. The girder overlapped the parapet rail. The deck sagged at this location, then rose slightly as it proceeded to Bent 65.

The LOWER SPAN was intact, but had sustained contact damage to the tubular hand railing to midspan.

The UPPER DECK ROADWAY surface sustained moderate damage. There was a rise over the bent cap that varied from approximately three (3) feet in 30 lineal feet in the #1 and #2 lanes to approximately 3.5 feet in 15 lineal feet in the #3 and #4 lanes.

Bent 65

East side

The UPPER COLUMN was severed at the top and base and had fallen away from the structure. The column was removed and was not visible.

The LOWER COLUMN was intact, but had fractures to the top, and the exterior mat of vertical reinforcing steel was pulled away from the east face approximately 1/2 of the way down its length. The steel was bent outward and down with the northern most bars bent outward, slightly up, and northward.

The UPPER CAP was resting on the lower deck, and the spans on each side were collapsed so as to create a hump over it. The upper cap shifted longitudinally approximately two (2) feet to the south of the lower cap.

The top mat of cap reinforcement was exposed, and the portion that hooked into the upper column had a northward bend.

West side

The UPPER COLUMN was severed below the horizontal joint at its base and collapsed, but remained attached to the upper cap. There was minor spalling of the concrete at the pinned connection joint. The column had a south tilt. The bottom was shifted north of the lower column and the top was shifted south. There was fractured concrete and exposed longitudinal steel on the inside (east) face at the column top, which corresponded to its contact with the lower parapet railing and cap.

The LOWER COLUMN was intact, but had fractures to the top, and the exterior mat of reinforcing steel was pulled away from the west face approximately 1/4 of the way down its length. This steel surrounded the north and south sides of the upper column.

The UPPER CAP appeared to be shifted longitudinally to the south of the lower cap. It shifted laterally westward approximately two (2) to three (3) feet.

The LOWER CAP was intact, the extent of its damage unknown.

Span 65

East side

The UPPER SPAN had sustained light to moderate damage and failed at the expansion hinge. The support span partially failed, fractured at the bent cap, and tilted downward to the north. There was extensive damage to the support span bearing seat. The overhang span, at the hinge, collapsed onto the lower deck and rose back off the deck as it proceeded to Bent 66. It was longitudinally shifted approximately one (1) to two (2) feet south over the lower hinge.

The LOWER SPAN had light to moderate damage with a partial failure at the expansion hinge. The hinge remained closed and the support span soffit, and hinge diaphragm, dropped approximately one (1) foot. There was fracture to the support span girder and deck, as well as to the overhang parapet railing at the hinge.

West side

The UPPER SPAN sustained light to moderate damage and failed at the expansion hinge. It had a westward shift of approximately one (1) to two (2) feet, which decreased as it proceeded to Bent 66. The support span partially failed, was fractured at the bent cap, and had a slight downward tilt to the north. The support span bearing seat was cracked and fractured. The hinge separated approximately one (1) to two (2) feet. The overhang span was resting on the lower deck sidewalk, and there was extensive damage to the bottom, west edge, of the hinge. There was also contact damage to the soffit at that location. The overhang hinge header was broken away, displaced northward, and rotated 180 degrees on its top. The hinge shifted approximately one (1) to two (2) feet south of the lower hinge. There was a slight rise in the deck as it proceeded to Bent 66. There was diagonal cracking in the exterior girder from the hinge to midspan and at approximately the 3/4 point.

The LOWER SPAN was intact, but sustained light overall damage, as well as light to moderate damage at the expansion hinge. The parapet rail was broken away at the sidewalk, from the hinge to midspan, with the fractures aligning with the upper span exterior girder fractures. The hinge was closed with fracture and cracking to the seats. The overhang span partially failed and was deflected down approximately two (2) to three (3) inches.

The UPPER SPAN ROADWAY surface sustained major damage and was impassable. There was an offset in the roadway, at the hinge, of approximately four (4) feet. There was major damage to the support span roadway and hinge diaphragm at the approximate locations of the hinge restrainer assemblies.

Bent 66

East side

The UPPER COLUMN was severed below its base and had collapsed, but remained attached to the upper cap. There was approximately three (3) feet of fractured concrete, which contained the vertical dowels, below the horizontal joint at the column base. There was extensive fracture to the upper portion of the column at the cap attachment. The vertical reinforcement was exposed, and the column core was fractured through to the exterior (east) face, midway down the column length. There was minor spalling of the column base at the horizontal joint. The column shifted less than approximately one (1) foot south, overlapping the lower hand rail support immediately south of the bent.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of reinforcing steel was pulled away from the east face approximately 2/3 of the way down its length.

The UPPER CAP appeared to be laterally aligned over the lower cap and shifted south less than approximately one (1) foot. There was major damage to the cap at approximately the east 1/3 point with a diagonal crack, approximately two (2) inches wide at the cap bottom, running diagonally westward from bottom to top.

The LOWER CAP had sustained minor spalls and light cracking at the west column interface, with the cracks extending approximately 1/4 of the way east along the cap.

West side

The UPPER COLUMN was severed at its base and had collapsed, remaining attached to the upper cap. There was fracture to approximately the upper

1/3 of the column, where it came in contact with the top of the lower cap and deck. The column was tilted, the base located to the north of the lower column, and the top slightly southward. The base of the column had severed at the horizontal joint, the vertical dowels and fractured portions of the keyway concrete were attached and visible. The dowels were mostly clean and clear of concrete and were bent west and south, with one bent approximately 90 degrees to the south.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of reinforcing steel was pulled away from the west face approximately 1/3 of the way down its length.

The UPPER CAP appeared to be laterally aligned over the lower cap, and shifted south less than approximately one (1) foot.

The LOWER CAP sustained minor spalling at the junction of the east column, and light to moderate cracking extending approximately 1/3 of the way west from the east column. The central portion of the cap was undamaged.

Span 66

East side

The UPPER SPAN remained intact, but sustained light to moderate damage. There was a lateral shift transition at Bent 66, with the span shifting eastward as it proceeded to Bent 67. The span was suspended between the bent caps and there was contact damage and spalling where the soffit impacted the lower hand railing supports. The exterior girder was moderately fractured at the Bent 66 cap. There was moderate to severe cracking in the girder approximately 10 feet north of the bent. There were diagonal cracks and fractured concrete at the girder-soffit interface, which extended to approximately 10 feet south of Bent 67. The cracking extended up to the top slab approximately five (5) feet south of Bent 67. There was fracture to the top slab extending approximately five (5) feet south of the bent.

The LOWER SPAN was intact, but sustained minor damage to the parapet railing.

West side

The UPPER SPAN sustained moderate damage and was slumped at midspan, where it came to rest on top of the lower deck. There was extensive fracture to the exterior girder at the bent cap which extended north for approximately 16 feet, tearing the girder away from the top slab. The top slab at this location had severe fracture and exposed reinforcement. This damage aligned with a ramping of the span upward as it rose off the lower deck at the bent cap. There was moderate damage to the span at Bent 67, which extended south approximately 15 feet. At this point the span made a slight rise as it crossed the cap. The lateral alignment of the upper to lower span made a transition eastward from Bent 66 to Bent 67.

The LOWER SPAN was intact, but sustained light damage. There was a tear in the soffit at the exterior girder, which extended north from Bent 67 for approximately 25 feet. There was also light diagonal cracking in the exterior girder at this location.

The UPPER SPAN ROADWAY surface sustained longitudinal cracks, running northward from the bent along the #1 and #2 lane lanes. There was light transverse cracking across the #1, #2, and #3 lanes, immediately north of the bent. The span had a slight hump over Bent 66.

Bent 67

East side

The UPPER COLUMN was severed at the top, and base, and had collapsed. The upper column came to rest south of, and leaning against, the lower column. The separation at the top was level with the top of the upper cap. The sign frame base block, which was constructed on top of the column, remained attached to the upper deck. The approximate top 1/2 of the column was completely fractured away, exposing the vertical reinforcement, which had been bent slightly outward and away from the column faces. The column had separated at the pinned connection joint, shearing the keyway and bending the dowels westward. There was extensive spalling and fractured concrete at the base of the upper column, above the horizontal joint, on the east and west faces, exposing the reinforcement.

The LOWER COLUMN was intact, but had sustained fractures to the top, and the exterior mat of was pulled away from the east face approximately 1/2 of the way down its length. The reinforcing steel had no apparent longitudinal offset.

The UPPER CAP sustained moderate damage, and was collapsed onto the lower deck. It had shifted approximately one (1) to two (2) feet to the south and approximately two (2) feet to the east of the lower cap. There was fracture to bottom portion of the cap. The top mat of cap reinforcement, which hooked into the upper column, was exposed and had a slight eastward bend. There was a very slight deflection of the roadway as it crossed over the cap. This slight hump was associated with the break up of the superstructure on either side of the cap.

The LOWER CAP sustained light cracking on its east end.

West side

The UPPER COLUMN was severed at the top, and base, and had fallen. The sign frame base block, which was constructed on top of the column, remained attached to the upper deck. There was extensive fracture to the upper east 1/2 of the column.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of reinforcing steel was pulled away from the east face approximately 1/3 of the way down its length.

The UPPER CAP sustained major damage, and was shifted over the lower cap less than approximately one (1) foot to the south and approximately two (2) to three (3) feet eastward. The cap was resting on the lower deck, and the fracture to this area was such that the upper roadway formed a hump as it crossed the cap. There was evidence of a fire at this location.

The LOWER CAP sustained moderate spalling at the junction of the lower west column and moderate to severe cracking along the approximate west 1/3 of the cap. The west end of the cap deflected down approximately one (1) to two (2) inches. The cracks extended into the soffit, which was separated from the exterior girder on either side of the cap on the west end. Crack severity decreased towards the center of the cap.

Span 67

East side

The UPPER SPAN sustained light damage, with light to moderate soffit fracture, top slab fracture, and exterior girder cracking adjacent to the bent caps. The span remained intact and was shifted laterally approximately two (2) feet eastward over the lower span. The span did not contact the lower roadway, but there was light contact damage to the soffit caused by contact with the lower deck handrail supports.

The LOWER SPAN was intact, but sustained light damage to the tubular hand railing.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. There was a diagonal tear in the exterior girder, located approximately six (6) feet north of the bent cap, that was approximately two (2) to three (3) feet wide and sloped up and northward. The parapet railing at the cap was removed as part of the recovery operation. There was extensive fracture to the exterior girder at Bent 68.

The LOWER SPAN sustained moderate damage, and partially collapsed at Bent 68. There was extensive cracking in the exterior girder throughout the span, which was most severe at the bent caps. There were tears in the soffit at the exterior girder, which extended from each bent cap towards center span, and came within approximately eight (8) feet of joining.

The UPPER SPAN ROADWAY surface had no obstructions to travel. It appeared relatively flat across the bent cap on lanes #1, #2, and #3. In lane #4 there was a slight rise over the cap.

Bent 68

East side

The UPPER COLUMN was severed at the top and base, and had collapsed. The west face vertical reinforcement was pulled away from the column. There was extensive fracture to the top half of the column, with bending in the vertical reinforcement.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of reinforcing steel was pulled away from the east face approximately 1/3 of the way down its length. This steel had an offset bend to the south.

The UPPER CAP sustained light damage and was resting on the lower deck. It had shifted laterally eastward approximately two (2) to three (3) feet and longitudinally southward approximately one (1) to two (2) feet. The top mat of cap reinforcement was exposed where it hooked into the upper column, and had a slight southward bend.

The LOWER CAP had sustained severe cracking at the east column.

West side

The UPPER COLUMN was severed at the top, and base, and had collapsed. The column had sustained extensive damage, and all but the west face was fractured away. The vertical reinforcement was exposed, and was only slightly bent. The column was severed cleanly at the horizontal pinned connection joint, and the vertical dowels were attached and bent eastward.

The LOWER COLUMN was intact, but sustained extensive fractures to the top, and the exterior mat of reinforcing steel was pulled away from the west face approximately 1/4 of the way down its length. This steel was bent up and westward, with several bars bent 90 degrees west.

The UPPER CAP sustained moderate to major damage, and had collapsed onto the lower deck. It appeared to have a slight southward shift and an approximately two (2) to three (3) foot eastward shift over the lower cap.

The LOWER CAP, on the west side, sustained extensive fractures, and a partial failure downward, which resulted in deflecting it, and the adjacent soffits, approximately three (3) to four (4) feet at the column, and exposing the lower mat of reinforcing steel. There was severe cracking, which extended into the soffit and exterior girder, that decreased towards the center of the cap.

Span 68

East side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower span parapet railing. The span separated at the expansion hinge. The support span remained attached to the bent cap, and was displaced approximately one (1) to two (2) feet southward. The hinge support diaphragm was destroyed, tearing the exterior girder downward and fracturing out the soffit in the first interior bay, approximately four (4) feet back towards the bent cap. This damage to the soffit aligned with the location of the cable hinge restrainer assembly. The overhang span dropped onto the lower parapet railing at the hinge. It also rose slightly, and increased its eastward offset as it proceeded to Bent 69. The overhang bearing seat remained intact, and was roughly aligned longitudinally over the lower hinge. There was extensive fracture in the exterior girder at the junction of Bent 69, which propagated into the soffit and top slab.

The LOWER SPAN was intact, but sustained light to moderate damage to the support span and the parapet railing. There was impact damage to the support span hinge, which resulted in a slight downward deflection of the hinge, and caused fracturing to the soffit at the exterior girder. There was light diagonal cracking in the support span exterior girder, and minor to moderate spalling at the base of the girder at the bent cap.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. There was extensive damage to the support span and hinge bearing seat. The overhang span maintained a level line across the span, then rose sharply up over the Bent 69 cap. There was extensive damage to the span at Bent 69.

The LOWER SPAN sustained major damage to the support span and hinge, and light to moderate damage to the overhang span. The exterior girder in the support span had extensive fracture and was torn from the soffit at the partially failed bent cap. The support span hinge diaphragm deflected down several inches and was fractured and separated from the girders. The overhang hinge had light damage. The span was intact, with diagonal cracking and a exterior girder soffit tear starting near approximately the 3/4 point and extending northward to Bent 69.

The UPPER SPAN ROADWAY surface and hinge sustained major damage, and would have been impassable to traffic in the #1, #2, and #3 lanes due to an approximate two (2) to three (3) foot vertical offset in the hinge. The #4 lane made a steep ramp upward from the hinge to the bent cap. There was extensive damage to the support span hinge diaphragm on the east and west sides. The center portion of the diaphragm remained intact, and it appeared as if the center cable restrainer assembly had severed cables.

Bent 69

East side

The UPPER COLUMN severed at the base below the pinned connection joint, and had collapsed. The column remained attached to the upper bent cap. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up and westward to the joint line. There was spalled concrete at the base along the northeast corner of the joint. There was extensive fracture to the approximate top 1/2 of the column where it came in contact with the lower portion of the bent. This damage extended through the column to the mid-east face, exposing the vertical reinforcement and fracturing away approximately 60% of the top half of the column. The exposed vertical steel was relatively straight.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of reinforcing steel was pulled away from the west face approximately 1/3 to 1/2 of the way down its length. This steel was bent over and pointed westward and downward, with several bars on the south side bent slightly southward. The approximate top four (4) to five (5) feet of this steel was still encased in concrete.

The UPPER CAP impacted the lower parapet railing and sustained light damage. It was shifted approximately three (3) to four (4) feet laterally eastward and was aligned longitudinally over the lower cap.

No data was recorded for the LOWER CAP at its east end.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. The column had extensive damage to the upper portion, with the concrete fracture extending midway down its length. The vertical reinforcement was exposed and mostly straight. The approximate top three (3) feet of the west face vertical bars had a westward bend.

The LOWER COLUMN was intact, but sustained fractures to the top, and a portion of the exterior mat of reinforcing steel was pulled away from the top to less than approximately 1/4 of the way down the west face. These bent bars were generally pointed southwest. The approximate top 1/4 of the west face of the column was fractured and the vertical reinforcement was exposed.

The UPPER CAP sustained moderate to major damage, and was shifted approximately three (3) to four (4) feet east and approximately one (1) to two (2) feet south over the lower cap. The upper deck had extensive fracture and formed a hump over the cap.

The LOWER CAP on the west side had severe cracking at the column, which decreased in severity towards the center of the cap. The cracks extended into the soffit of span 68.

Span 69

East side

The UPPER SPAN sustained light to moderate damage, and was resting eastward and above the lower parapet railing. There was a slight sag in the center portion of the span, with light diagonal cracking in the exterior girder at the sag transition areas. There was a severe diagonal crack running up, and northward, approximately 15 feet north of the bent. This crack was centered along an approximate five (5) to six (6) foot long soffit tear, and extended into a spalled area of the top slab. This damage aligned with the beginning of the span sag. There was fracture to the soffit at the exterior girder, which transitioned into a soffit tear that started at midspan and progressed to Bent 70. This tear was widest at approximately five (5) to seven (7) feet south of the bent. This tear aligned with an extensively fractured, and vertically offset, portion of the exterior girder at the northernmost limit of the span sag. This damage propagated into the top slab.

The LOWER SPAN was intact, and had no noticeable damage.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck at the bent and sloped upward, rising off the deck at Bent 70. There was extensive fracture to the span at the bent, which formed a hump over the cap. There was diagonal cracking throughout the span. There was a fracture in the span, which aligned with a break in the deck line that was located approximately 10 to 12 feet south of Bent 70. This fracture consisted of moderate diagonal cracks, and spalling, and fracture in the top slab and soffit. The lateral alignment over the lower span was eastward, but moved towards neutral alignment as it proceeded towards Bent 70.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface had a moderate diagonal crack, which extended from Bent 69 on the east side to just south of Bent 70 on the west side. This crack extended into the exterior girders. The asphalt/concrete pavement had areas of thrust buckling along the crack. All lanes would have been passable to traffic in this span.

Bent 70

East side

The UPPER COLUMN severed at the top and base, and had collapsed. The column separated at the horizontal pinned connection joint at the top. The interior (west) mat of vertical reinforcement was torn away from the column, and remained attached to the lower column. This steel was bent downward then formed a "U" back up vertically, with a south offset. The column fractured at its base, separating at the fixed connection, in the area of the splices with the lower column vertical steel.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out approximately 1/2 down the west face. The majority of this steel was bent outward and slightly south, however, the longer lap bars were bent more severely.

The UPPER CAP sustained light damage, and had collapsed onto the lower deck. There was moderate spalling to the bottom of the cap, directly above the horizontal joint. The cap was shifted approximately one (1) foot north and approximately one (1) to two (2) feet eastward over the lower cap.

The LOWER CAP sustained light cracking at the junction of the east column.

West side

The UPPER COLUMN severed at the top and base, fell inward (east), and was crushed by the upper cap. A portion of the northwest top column corner fractured and fell to the west, but remained attached to the column's vertical reinforcement. The column was fractured at the base, and separated at the fixed connection, in the area of the splices with the lower column vertical steel.

The LOWER COLUMN was intact, but had fractured and spalled concrete on the west face, approximately 1/4 of the way down from the top. The splice bars pulled away from the column face and the remainder of the vertical reinforcement was exposed, but encased, inside the column.

The UPPER CAP sustained light damage, collapsing onto the lower deck. There was moderate spalling to the base of the cap directly above the horizontal pinned connection joint. The cap shifted approximately one (1) foot south and approximately one (1) to two (2) feet eastward over the lower cap.

The LOWER CAP sustained light cracks at the junction with west column. There was no data recorded for the central portion of the cap.

Span 70

East side

The UPPER SPAN sustained moderate to major damage, and had partially collapsed onto the lower deck. The span was intact for approximately the first 10 feet north of the cap, where there was extensive fracture and tearing to the exterior girder, soffit and top slab. At this location, the span began to collapse, and there was a vertical offset in the girder line. The central 1/2 of the span rested on the lower deck, and had moderate to severe diagonal cracking. Approximately eight (8) to 12 feet from Bent 71, there was another major fracture and tear in the exterior girder, which extended into the soffit. At this location, the span began to rise up off the lower deck, as it proceeded toward Bent 71. The rest of the span had moderate diagonal cracks and was attached to Bent 71. The parapet railing was missing along the sagged portion of the span, with the exception of the center rail section which remained in place.

The LOWER SPAN remained intact, and had no noticeable damage.

West side

The UPPER SPAN sustained moderate damage and had collapsed onto the lower deck and railing at Bent 71. Proceeding north from the bent, the span was intact, with light diagonal cracking, until the approximate 2/3 point. At this location, there was extensive damage to the span, with severe diagonal cracking, fracture, and tearing of the exterior girder. This damage extended into the soffit and top slab, and continued to Bent 71. An approximate five (5) to eight (8) foot section of the exterior girder, that was attached to Bent 71, overlapped the lower span parapet railing. The last two sections of upper parapet, on the north end of the span, were broken off the top slab and thrust eastward at their junction. This damage aligned over the major tear in the girder. The lateral offset transitions from eastward to westward along this span.

The LOWER SPAN was intact, and had minor damage to the parapet railing.

The UPPER SPAN ROADWAY surface sustained major cracking and fracture to the top deck, which ran diagonally from the east edge, immediately north of the bent, to the west edge slightly north of midspan. Across the #1 and #2 lanes, the deck and pavement were fractured and torn. Across the #3 and #4 lanes, the asphalt/concrete pavement was thrust fractured vertically, as high as 18 inches. A secondary crack in the roadway started on the west edge of the #4 lane, approximately 20 feet north of the bent, and ran northeast, meeting the main fracture at the east edge of lane #3.

Bent 71

East side

The UPPER COLUMN severed at the top, and base, and had collapsed. The column separated at the horizontal pinned connection joint at the top. The interior (west) mat of vertical reinforcement was pulled from the column and remained attached to the lower column. The column fractured at its base, separating at the fixed connection, in the area of the splices with the lower column vertical steel. The column top came to rest on the ground, south of the bent. The bottom remained attached to the lower column's east mat of vertical steel, and was leaning against the bottom of the lower column.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out approximately 1/3 of the way down the east face. The splice bars were bent out and upward, and were shifted to the south.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower roadway. It was longitudinally shifted approximately one (1) foot to the north and had a westward shift over the lower cap. The cap was broken along its central portion, which caused a fracturing of the prestressing tendons that resulted in the rods punching through the cap end and extending several feet out from the east cap face.

The LOWER CAP had no apparent damage to its east end.

West side

The UPPER COLUMN severed at the top, and base, and had collapsed to the ground. It sustained light damage, having separated cleanly at the top and bottom pinned connection joints. There was minor spalling to the base and minor to moderate spalling at the top, at the horizontal joints. The column came to rest on its south face, perpendicular to the roadway, with its base closest to the bent.

The LOWER COLUMN was intact and had minor fracture and spalling to the approximate top two (2) feet, which exposed the west mat vertical reinforcement. One of the vertical bars was bent 30 to 45 degrees westward and the remainder were in place.

The UPPER CAP sustained light damage and was collapsed onto the lower deck. It was shifted laterally approximately three (3) feet eastward over the lower cap. It was longitudinally aligned, but had a southward tilt. A prestress rod, in the lower north corner, broke through the west cap face. The vertical dowels which extended into the column top, were attached to the bottom of the cap and were bent westward.

The LOWER CAP had no apparent damage at its west end. No data was collected for the central portion of the cap.

Span 71

East side

The UPPER SPAN sustained moderate damage, and failed at the expansion hinge. The overhang span collapsed onto the lower deck, and the span arched back off the deck as it approached Bent 72. The span was laterally shifted to the west. The support span had diagonal cracks in the exterior girder, and spalling at the connection with the soffit. The overhang span contacted the support span, underriding, and destroying the hinge diaphragm. The overhang span had moderate cracking and fracture along its length. There was extensive girder damage at Bent 72.

The LOWER SPAN sustained light to moderate damage, with a partial failure of the expansion hinge. The support span had diagonal cracking in the girder, and cracking at the hinge bearing seat. The overhang span had displaced downward approximately several inches at the hinge, and had diagonal cracks and soffit fractures along the exterior girder, which extended from midspan to approximately six (6) feet south of Bent 72. At a point approximately 10 feet south of the bent, the deck deflected downward to align with the hinge failure. The overhang hinge sustained major damage. The bearing seat, hinge diaphragm, and exterior girder area had extensive fracture, which extended through the top slab into the parapet railing. The overhang span appeared to be thrust into the support span.

West side

The UPPER SPAN sustained major damage to the support span and moderate damage to the overhang span. The span failed at the expansion hinge. The overhang span collapsed onto the lower deck at the hinge and contacted the parapet railing. The span appeared to be laterally offset approximately one (1) to two (2) feet west over the lower span. The span rose off the lower deck as it proceeded towards Bent 72. The support span had extensive fracture to the exterior girder and soffit, and was twisted southward and westward, overlapping the lower railing. The support hinge diaphragm was destroyed, and was thrust southward approximately one (1) to two (2) feet. The overhang hinge diaphragm had light damage and appeared to be longitudinally aligned over the lower hinge. There were spalled areas at the soffit-girder interface, and light diagonal cracks in the girder throughout the span. There was extensive fracture to the exterior girder at Bent 72, which propagated into the top slab, tearing it away from the girder top.

The LOWER SPAN was intact and sustained light damage. There was damage to the parapet railing, which appeared to be a result of the rescue operation. There were light diagonal cracks in the exterior girder. The hinge remained intact, and closed, with light cracks and minor spalls.

The UPPER SPAN ROADWAY surface and HINGE, sustained major damage and was impassable to traffic due to the failure, and vertical offset, of the expansion hinge. The support hinge diaphragm was destroyed for all but a small section at midspan. The overhang span was thrust under, and below, the support span slightly. The cable restrainer assemblies pulled through the support diaphragm.

Bent 72

East side

The UPPER COLUMN severed at the top, fractured at the base, and collapsed, falling north of the bent. The column separated at the top horizontal joint cleanly and fractured at its base, separating at the fixed connection, in the area of the splices with the lower column vertical steel.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, to approximately 1/2 way down the east face. This steel, which included the splice bars, had an outward and southward bend, with a north twist, which aligned with the resting place of the upper column.

The UPPER CAP sustained light to moderate damage and collapsed onto the lower deck slightly south and west of the lower cap. The cap was broken along its central portion, which caused a fracturing of the prestressing tendons that resulted in the rods punching through the cap end and extending several feet out from the east cap face.

The LOWER CAP had damage similar to the west side of the cap. At approximately eight (8) feet from the east side, there was major fracture and a partial failure of the cap, which exposed the reinforcing steel.

West side

The UPPER COLUMN had separated at the upper and lower pinned connection joints and was ejected approximately 20 feet west of the bent. The column sustained light damage with moderate spalling to the interior (east) faces at the horizontal joints, which partially exposed the ends of the vertical reinforcement.

The LOWER COLUMN was intact and sustained minor damage at its top, where the concrete was spalled on the west face at the horizontal joint. The vertical dowels were attached to the top of the column and were bent westward approximately 30 degrees.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck. The cap was positioned slightly north, and approximately one (1) to two (2) feet west, over the lower cap. There was a rotation in the cap such that the west end was higher than the center, and the west face was tilted upward. This rotation caused a twisting fracture in the adjacent exterior girders. Several of the prestressing rods were punctured through the cap face. The vertical dowels were attached to the cap and were bent 90 degrees westward.

The LOWER CAP sustained minor spalling and light to moderate cracking at the column. The cracks propagated westward into the column and eastward into the soffit. The cracking decreased towards the center of the cap, which was undamaged.

Span 72

East side

The UPPER SPAN sustained minor to moderate damage, and formed a curved sag, with the midspan soffit almost contacting the lower roadway. There was light to moderate diagonal cracking to the exterior girder, which corresponded to the span sag. There was a tear in the soffit, and moderate fracture to the girder at Bent 73. The lateral shift transitions from west to east as the span proceeded to Bent 73.

The LOWER SPAN was intact, but sustained contact damage to the parapet railing at the hand rail supports, and light diagonal cracking and soffit spalls to the exterior girder in the approximate first 1/2 of the span.

West side

The UPPER SPAN sustained moderate damage, and remained suspended over the lower roadway. There was light diagonal cracking throughout the exterior girder. There was a twisting fracture to the girder at Bent 72, and a tearing in the soffit at the girder, which extended to midspan. There was extensive damage to the girder, and a partial collapse of the top deck at the approximate 3/4 point of the span. The girder was separated from the span, and twisted, with the exterior face pointed upward. The girder was still attached to the span as it approached Bent 73.

The LOWER SPAN was intact, but sustained light diagonal cracking at each end.

The UPPER SPAN ROADWAY surface had a sharp rise in the #1 lane at the bent cap. The #2 and #3 lanes were intact. There was a partial failure, and large depression, in the #4 lane just south of Bent 73, which aligned with the west side span damage.

Bent 73

East side

The UPPER COLUMN severed at the top, and base, and had collapsed. The column separated at the horizontal pinned connection joint at the top and fractured at the connection with the cantilever lower cap, at its base, and fell to the ground.

The LOWER COLUMN was intact, with moderate cracking to the northeast corner approximately three (3) feet above the ground line. The cracks extended across the east face and angled downward.

The UPPER CAP sustained moderate damage, and had collapsed onto the lower deck. The cap was broken along its central portion, which caused a fracturing of the prestressing tendons that resulted in the rods punching through the cap end and extending several feet out from the east cap face. The cap had a slight upward tilt to the east face, and was longitudinally aligned and laterally shifted eastward over the lower cap. There was extensive fracture to the bottom of the cap, at the connection with the column, and the contact area with the lower parapet railing. The upper deck formed a hump over the cap.

The LOWER CAP, on the west side, was undamaged, as was the central portion of the cap.

West side

The UPPER COLUMN separated at the upper and lower pinned connection joints, and was ejected approximately 20 feet west of the bent. The column sustained light damage, with moderate spalling to the interior (east) faces at the horizontal joints. The ends of the column were indented in the area of the keyway, and there were holes where the dowels had been embedded.

The LOWER COLUMN was intact with minor spalling and fracture to the top, west face, directly below the horizontal joint. The vertical dowels were attached and bent approximately 45 degrees westward.

The UPPER CAP sustained moderate to major damage, and had partially collapsed onto the lower deck. The vertical dowels remained attached to the bottom of the cap and were bent approximately 90 degrees westward. The cap shifted slightly eastward and approximately one (1) to two (2) feet to the north, over the lower cap. The cap was twisted slightly southward and aligned with the slope in the deck across the bent. There was spalling to the west face of the cap and several of the prestress rods were protruding through the cap face. There was a severe vertical crack, and spalled concrete, at the midpoint along the cap. At the approximate west 1/4 point, the cap was severed vertically and was torn away from the soffit and had dropped approximately four (4) feet down to the lower roadway surface. The west end of the cap tilted back up and was attached to the soffit at the column. The west face of the cap was tilted upward.

The LOWER CAP was severed on the east side at the cantilever end, and the top and bottom mat of reinforcement were exposed. The top bars were exposed for approximately 12 to 18 inches, and were relatively straight. The bottom bars were exposed for approximately 18 to 24 inches, and were bent downward approximately 30 degrees from horizontal. A portion of the cap remained attached to the bottom of the column, which fell away.

Span 73

East side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck approximately 10 feet north of Bent 73. There was a twisting fracture to the exterior girder at the cap. The span slanted down to the break, approximately 10 feet north of Bent 73, then sloped back up, off the deck, as it approached Bent 74. There was extensive fracture and tearing, with a vertical offset, in the girder at the break, which extended into the top slab and soffit. The girder tear extended up from the soffit, and northward, into the top deck. There was light to moderate diagonal cracking in the girder, which began at the approximate 2/3 point and continued to Bent 74. The span was shifted approximately one (1) foot to the east and appeared to have contacted the lower parapet railing.

The LOWER SPAN was intact, and had minor contact damage to the parapet railing and hand railing supports.

West side

The UPPER SPAN was intact, but sustained light to moderate damage and had partially collapsed at the bent. The deck line sloped upward to, and across, Bent 74. There was a severe tear, and fracture, in the soffit, which started approximately five (5) to 10 feet north of the bent, and which was several feet in width. As the tear propagated to the north, it decreased in severity and closed up, ending at midspan. At the approximate 1/4 point along the span, there was moderate fracture and diagonal cracking in the exterior girder, which extended from the soffit into the upper slab. There were longitudinal soffit cracks that aligned with the upper cap fractures.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was tilted down towards the east. This tilt increased as the span proceeded to Bent 74. There was a partial collapse of the #1 lane near the bent. There was a severe longitudinal crack which ran the length of the span along the lane line between the #1 and #2 lanes.

Bent 74

East side

The UPPER COLUMN severed at the top, and base, and had collapsed. The column separated at the horizontal pinned connection joint at the top and fractured at the connection with the cantilever lower cap, at its base, and fell to the ground.

The LOWER COLUMN was intact, and had no noticeable damage.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck. The cap was shifted slightly eastward and northward over the lower cap. There was spalling to the lower east face, and the bottom of the cap was moderately fractured at the column connection and at its contact point with the lower deck. The cap had a slight south tilt, which aligned with the slope of the span across the bent. There was a vertical break in the cap approximately 25 feet from the east end.

The LOWER CAP cantilever on the east end was fractured away, and had diagonal cracks running eastward, and up, from the bottom of the cap into the fractured end section.

West side

The UPPER COLUMN had remained in place. It was tilted eastward and had a horizontal gap crack and minor fracture at the base, along the pinned connection joint. There was spalled concrete on the east half of the column directly below the upper cap connection. There was minor crush fracture to the top east edge.

The LOWER COLUMN was intact, and had no noticeable damage.

The UPPER CAP sustained light to moderate damage and remained in place, tilting downward to the collapsed east side, and southward to align with the slope of the span from the collapse at Bent 73. The cap was broken along its east side, which caused a fracturing of the prestressing tendons that resulted in several of the prestress rods punching through the cap end and extending several feet out from the spalled west cap face. There was spalled concrete and minor crush fracture to the bottom of the cap at the east portion of the connection with the column. The cap shifted approximately several inches to the east and north over the top to the column.

The LOWER CAP sustained light vertical cracking on the west side at the column. The central portion of the cap was undamaged.

Span 74

East side

The UPPER SPAN sustained moderate damage and formed a sag, with the low point located approximately 3/4 of the way to Bent 75. The support span partially failed and sloped downward, from a break point located three (3) to four (4) feet north of the bent, to the expansion hinge. There was diagonal cracking in the exterior girder of the support span, and the soffit was torn at the bottom of the girder, from the hinge to the break point. There was minor fracture and spalling to the support span hinge section. The hinge was slightly separated and was longitudinally aligned over the lower hinge. The overhang hinge diaphragm was intact. There were light diagonal cracks in the exterior girder of the overhang span, which increased in severity at the low point of the span sag. There was moderate fracture to the girder at Bent 75, which extended into the top slab and soffit. The span formed a hump as it crossed Bent 75. The span was laterally shifted approximately one (1) foot eastward over the lower span.

The LOWER SPAN was intact, and sustained minor contact damage to the parapet and hand railing.

West side

The UPPER SPAN remained in place, and had sustained light damage. The span sloped upward to the expansion hinge then made a sharp bend downward toward Bent 75. There was a separation in the hinge, above the bearing seat, and fracture to the overhang section, from the seat up, and northward, into the top slab. There was a moderate diagonal crack in the soffit and bottom of the exterior girder approximately two (2) feet south of Bent 75.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was sloped sharply downward to the east. The hinge was opened up approximately eight (8) to 12 inches and there was a slight vertical offset in the # 1, #2, and #3, lanes.

Bent 75

East side

The UPPER COLUMN severed at the top, fractured at the base, and had collapsed. The column was removed during rescue operations and was not inspected.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face. This steel, which included the splice bars, had an outward and downward bend, with a north and south bend to the exterior bars in the mat. The top portion of the column was fractured, and the lower cap reinforcement was exposed.

The UPPER CAP sustained light to moderate damage, and was longitudinally aligned and laterally shifted to the east over the lower cap. There was moderate to major fracture to the bottom of the cap where it attached to the column and contacted the lower deck.

The LOWER CAP was intact, but sustained minor cracking at the column connection.

West side

The UPPER COLUMN partially collapsed and slipped several feet down the side of the lower column. The failure occurred at the base, directly above the horizontal pinned connection joint, with the fracture extending from the middle of the base upward and eastward. The east mat of vertical reinforcement extended from the column into the fractured portion of the base, which also contained the vertical dowels. There was spalled concrete on the east and west faces of the column top directly below the horizontal joint. There was minor crush fracture to the top east edge of the column. The column was tilted northward.

The LOWER COLUMN was intact, but sustained minor spalling to the top west edge at the horizontal joint.

The UPPER CAP sustained light damage, partially collapsing onto the lower deck. The cap slipped eastward several inches. The upper column slipped eastward and northward under the cap. There was minor spalling to the bottom of the cap, on the west face, and minor crush fracture to the bottom of the cap, at the east column connection area. The cap was broken along its east side, which caused a fracturing of the prestressing tendons that resulted in several of the prestress rods punching through the cap end and extending several feet out from the spalled west cap face.

The LOWER CAP was intact, but sustained minor cracking at the column connections.

Span 75

East side

The UPPER SPAN had sustained moderate damage, formed a sag between the bents, and collapsed onto the lower deck. The parapet railing was missing throughout the span. There was diagonal cracking in the exterior girder throughout the span, which was the most severe at approximately the 1/4 and 3/4 points. There was extensive girder fracture at the bent caps that extended from the soffit into the top slab. There was a moderately fractured area at the 1/4 point.

The LOWER SPAN was intact, but sustained minor damage to the rail.

West side

The UPPER SPAN had sustained minor damage, partially collapsed at the bent, and sloped back up into place at Bent 76. There was a spall approximately six (6) feet long at the junction of the exterior girder and the soffit located at the approximate 3/4 point along the span. Diagonal cracks were running up and southward from the spall.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface steeply sloped downward to the east. There was a hump in the #1 lane at Bent 75.

Bent 76

East side

The UPPER COLUMN had severed at the top, fractured at the base, and collapsed, falling north of the bent. The column separated at the top horizontal joint and fractured at its base, separating at the fixed connection, in the area of the splices with the lower column vertical steel. There was moderate fracture and spalls at the column top, and the interior (west) mat of vertical reinforcement was pulled away from the west column face and remained attached to the lower column.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 2/3 of the way down the east face. This steel remained attached to the bottom of the upper column and was bent straight down.

The UPPER CAP had sustained light to moderate damage and collapsed onto the lower deck slightly south and east of the lower cap. There was minor spalling to the bottom of the east cap face, directly above the horizontal joint. One of the center prestress rods punctured, and was extended through, the cap face. There was extensive fracture, exposed reinforcement, and a partial failure of the cap just west of its contact point with the east side of the lower deck. The vertical dowels remained attached to the bottom of the cap and were bent approximately 90 degrees eastward. There was a severe vertical crack, through the cap, approximately 1/3 of the way from the end, which was approximately three (3) inches wide at the bottom and extended into the soffit.

The LOWER CAP on the east side was intact, but sustained minor damage. There were light vertical cracks at the east column connection.

West side

The UPPER COLUMN remained in place and sustained minor damage. There was minor spalling on the west face, directly below the top horizontal pinned connection joint, and crush fracture to the top east column edge. There was light longitudinal cracking in the base of the column at the east side, which extended up approximately three (3) to four (4) feet from the horizontal joint. The column was tilted slightly eastward, rotating about, and opening up, the lower horizontal joint.

The LOWER COLUMN was intact, and had no noticeable damage.

The UPPER CAP had sustained minor to moderate damage and remained in place, but was tilted downward to the east. The cap slid eastward on the column top, and was tilted slightly to the south to align with the span line from the partial failure at Bent 75. There was minor spalling to the west face at the column connection, and two of the lower, south, prestress rods punctured, and were extended through, the cap face. There was a severe vertical crack through the center of the cap, which extended into the soffit.

The LOWER CAP was intact, but sustained minor damage. There were light vertical cracks at the west column connections. The center of the cap had no noticeable damage.

Span 76

East side

The UPPER SPAN had sustained light to moderate damage, and had remained suspended over the lower deck. The deck formed a hump as it crossed over Bent 76. There was moderate fracture to the exterior girder at the bent cap which extended into the top slab. The span line sloped down approximately one (1) to two (2) feet vertically, to a point approximately eight (8) to 10 feet north of the bent, then gradually rose up towards Bent 77. There was moderate fracture in the soffit that extended diagonally through the exterior girder and into the top slab, at this sag point. There were light diagonal cracks in the exterior girder near Bent 77. The lateral alignment of the upper span was eastward and it increased towards Bent 77.

The LOWER SPAN was intact, with no noticeable damage.

West side

The UPPER SPAN was intact, and had no noticeable damage.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was sloped sharply down towards the east. There was a large area of fractured and shattered asphalt/concrete pavement and top slab concrete in the #1 and #2 lanes, at Bent 76, which aligned with the hump in the deck at the cap and decreased in size to the west. The #3 and #4 lanes had no noticeable damage.

Bent 77

East side

The UPPER COLUMN had severed at the top, fractured at the base, and collapsed, falling to the north of the bent. The column separated at the horizontal pinned connection. The vertical dowels were attached, and were bent westward flat against the top of the column. The base fracture occurred at the fixed connection, in the area of the splices with the lower column vertical steel. The interior (west) mat of vertical reinforcement was pulled away from the west column face, but remained attached to the lower column.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 2/3 of the way down the east face. This steel remained attached to the bottom of the upper column and was bent straight down.

The UPPER CAP had sustained light to moderate damage and collapsed onto the lower deck. The cap was longitudinally aligned and laterally offset approximately three (3) to four (4) feet east over the lower cap. There was extensive fracture at the column connection and the area of contact with the lower deck.

The LOWER CAP was intact, and there was no damage recorded.

West side

The UPPER COLUMN remained in place, but sustained minor damage. There was minor spalling on the west face, directly below the top horizontal pinned connection joint, and crush fracture to the top east column edge. There was light longitudinal cracking in the top of the column, at the east side, which extended midway down through the column. The column was tilted slightly eastward. It rotated about, and opened up, the horizontal joints.

The LOWER COLUMN was intact, and had no noticeable damage.

The UPPER CAP sustained minor damage and remained in place, tilting downward to the east. It was longitudinally aligned and laterally shifted eastward over the lower cap. The cap slid eastward on top of the column and had minor crush fracture at the east side of the column connection. The cap had a vertical break at the center that resulted in one of the prestress rods punching through the cap end and extending out from the spalled west cap face. The prestress end anchorage section was vertically split approximately three (3) to four (4) inches away from the cap end.

The LOWER CAP was intact, and there was no damage recorded.

Span 77

East side

The UPPER SPAN had sustained light damage, and remained suspended over the lower deck. The support span soffit was torn at the bottom of the girder approximately four (4) to five (5) feet from the expansion hinge. There was approximately 20 feet of hand railing missing at the bent cap. The support span hinge diaphragm was fractured and deflected downward approximately two (2) inches. There was a minor soffit tear at the girder approximately 15 feet in length at Bent 78. There was light to moderate fracture, and diagonal cracking, in the girder at Bent 78. The span was shifted approximately three (3) to four (4) feet eastward over the lower span.

The LOWER SPAN was intact, and had no visible damage.

West side

The UPPER SPAN was intact, and had no noticeable damage. It remained in place over the lower span, and there was a slight separation in the expansion hinge.

The UPPER SPAN ROADWAY surface was sharply sloped down to the east. There was no apparent damage to the roadway. The expansion hinge was intact with a slight vertical separation of approximately one (1) to two (2) inches on the east side.

Bent 78

East side

The UPPER COLUMN had severed at the top, fractured at the base, and collapsed. The top separated at the horizontal joint, and a rectangular section of the cap fractured away and remained attached to the column. This section was on the east side of the column, and the two eastern vertical dowels were embedded in the concrete. The two western dowels were exposed in the top of the column and were bent slightly westward. The west mat of vertical reinforcement was pulled away midway up from the bottom and was bent up against the top half of the column face, with a downward "U" bend above the horizontal joint. The base fracture occurred at the fixed connection, in the area of the splices with the lower column vertical steel.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face. This steel remained attached to the bottom of the upper column and was bent straight down.

The UPPER CAP had sustained light to moderate damage, and collapsed onto the lower deck. It was longitudinally aligned and laterally shifted approximately three (3) feet eastward over the lower cap. A rectangular section, approximately two (2) feet wide, separated from the lower east side of the cap and remained attached to the top of the column. There was light damage to the cap where it contacted the lower deck parapet railing.

The LOWER CAP was intact, and had minor cracks at the column connection.

West side

The UPPER COLUMN remained in place, but sustained minor damage. There was minor spalling on the west face, directly below the top horizontal pinned connection joint, and crush fracture to the top east column edge. There was spalled, fractured, concrete and exposed reinforcement on the northeast side of the column at the upper joint, and less severe spalls on the southeast corner. The column was tilted eastward and northward. It rotated about, and opened up, the lower horizontal joint.

The LOWER COLUMN was intact, and had no recorded damage.

The UPPER CAP had remained in place, but was tilted slightly northward and shifted eastward and northward over the lower cap. The cap had a vertical break at the center that resulted in several of the prestress rods punching through the cap end and extending out from the spalled west cap face. This break was two (2) to three (3) inches wide at the cap bottom and closed up at the top, extending into the soffit. The cap slid eastward several inches on the column top and had fracture along the north and south sides, at the column.

The LOWER CAP was intact, and had with minor cracks at the column connection.

Span 78

East side

The UPPER SPAN sustained light to moderate damage, but remained suspended over the lower deck. The span was shifted approximately three (3) feet eastward over the lower span. There were diagonal cracks and a tear in the soffit at the girder, from the bent top to the approximate 1/4 point along the span. The central 1/2 of the span was undamaged. The span sloped slightly downward to the approximate 3/4 point, where there was a vertical fracture and diagonal cracks in the girder and a tear in the soffit, which extended to Bent 79. The span sloped up from the approximate 3/4 point to Bent 79, and there was moderate diagonal fracture to the girder at the cap.

The LOWER SPAN was intact, and had no noticeable damage.

West side

The UPPER SPAN was intact, and had no noticeable damage.

The LOWER SPAN was intact, but sustained a minor soffit spall at the exterior girder, located approximately 1/3 of the way along the span. There was an approximate 10 foot crack in the parapet railing at Bent 79.

The UPPER SPAN ROADWAY was sloped sharply down to the east. There was no apparent damage to the roadway surface.

Bent 79

East side

The UPPER COLUMN had severed at the top, fractured at the base, and collapsed. The top separated at the horizontal pinned connection joint, but the vertical dowels, and fractured keyway concrete, remained attached. The dowels were bent westward and flat against the column top. The base fracture occurred at the fixed connection, in the area of the splices with the lower column vertical steel. A portion of the interior (west) mat of vertical reinforcement remained attached to the lower column, and was pulled away from the west column face. The remainder of the west mat of vertical reinforcement was pulled away midway up from the bottom, and was bent up against the top half of the column face with a downward "U" bend at the ends.

The **LOWER COLUMN** was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face. This steel remained attached to the bottom of the upper column, and was bent down and northward.

The **UPPER CAP** sustained light to moderate damage, and had collapsed onto the lower deck. It was shifted slightly south, and approximately three (3) feet east, over the lower cap. A rectangular section, approximately two (2) feet wide, separated from the lower east side of the cap, in the dowel embedment area, and fractured, remaining partially attached to the 1/2 inch containment steel. There was light damage to the cap where it contacted the lower deck parapet railing.

The **LOWER CAP** was intact on the east, and had no noticeable damage.

West side

The **UPPER COLUMN** remained in place with minor damage. The column was tilted eastward. It rotated about, and opened up, the lower horizontal joint. There was crush fracture to the top east side at the cap connection, and minor spalling at the lower east side of the lower column connection.

The **LOWER COLUMN** was intact, and had no noticeable damage.

The **UPPER CAP** had sustained minor damage and remained in place, tilting downward to the east. It was longitudinally aligned and laterally shifted eastward, over the lower cap. The cap slid eastward on top of the column, and had minor crush fracture along the north and south faces at the column connection. The cap had a vertical break at the center, that resulted in one of the prestress rods punching through the cap end and extending out from the spalled west cap face. This break was approximately two (2) inches wide at the bottom, closed up at the cap top, and extended into the soffit.

The **LOWER CAP** was intact on the west end, and had no noticeable damage.

Span 79

East side

The **UPPER SPAN** had sustained light to moderate damage, but remained suspended over the lower deck. The span was shifted approximately three (3) feet eastward over the lower span. There was a slight hump in the span as it crossed Bent 79. There was a tear in the soffit and diagonal cracks in the girder from the bent to the approximate 1/4 point of the span. The central 1/2 of the span was undamaged, and there was evidence of light diagonal cracking and soffit spalls at the north end.

The **LOWER SPAN** was intact, and had no noticeable damage

West side

The UPPER SPAN was intact, and had no noticeable damage.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was sloped sharply down to the east, and had no apparent damage to the surface.

Bent 80

East side

The UPPER COLUMN had severed at the top, fractured at the base, and collapsed. The top separated at the horizontal pinned connection joint with the vertical dowels, and the fractured keyway concrete remained attached. The dowels were bent westward and flat against the column top. The base fracture occurred at the fixed connection, in the area of the splices with the lower column vertical steel. A portion of the interior (west) mat of vertical steel remained attached to the lower column, and was pulled away from the west column face. The remainder of the west mat of vertical steel was pulled away midway up from the bottom, and was bent up against the top half of the column face.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 3/4 of the way down the east face. This steel remained attached to the bottom of the upper column and was bent straight down.

The UPPER CAP had sustained light to moderate damage and collapsed onto the lower deck. It was shifted approximately one (1) foot south and approximately three (3) to four (4) feet east, over the lower cap. A rectangular section, approximately two (2) feet wide, separated from the lower east side of the cap, in the dowel embedment area. This section was fractured, but remained partially attached to the 1/2 inch containment steel. There was light damage to the cap where it contacted the lower deck parapet railing.

The LOWER CAP was intact, and had no noticeable damage.

West side

The UPPER COLUMN remained in place, and sustained minor damage. The column was tilted eastward. It had rotated about, and opened up, the lower horizontal joint. There was crush fracture to the top east side at the cap connection, and minor spalling at the lower east side of the lower column connection.

The LOWER COLUMN was intact, and had no noticeable damage.

The UPPER CAP had sustained minor damage and remained in place, tilting downward to the east. It was longitudinally aligned and laterally shifted eastward over the lower cap. The cap slid eastward on top of the column, and had minor crush fracture along the north and south faces at the column connection. The cap had a vertical break at the center, that resulted in several of the prestress rods punching through the cap end and extending out from the spalled west cap face. This break was approximately two (2) inches wide at the bottom, closed up at the cap top, and did not extend into the soffit.

The LOWER CAP was intact, and had no noticeable damage.

Span 80

East side

The UPPER DECK sustained moderate damage, partially failing at the expansion hinge and tearing laterally eastward at Bent 81. The support span was intact, but the parapet railing was missing. The overhang span was vertically offset at the hinge, approximately two (2) to three (3) feet above the support span, and also sloped down to a point approximately 10 feet south of Bent 81, where it leveled off. There was extensive fracture and tearing in the soffit of the overhang span, at the hinge, which appeared to be the result of the east hinge restrainer assembly tearing through the overhang hinge diaphragm. The overhang span was laterally offset approximately one (1) foot eastward from the support span. There was diagonal cracking and fracture to the exterior girder near Bent 81, which extended into the soffit and top slab for approximately 10 feet to the bent cap. The girder was pulled away from the soffit and angled eastward, to Bent 81.

The LOWER SPAN was intact, but sustained light damage to the parapet railing at Bent 81. The last section of railing was broken away from the top slab, at the base, and angled eastward toward the bent cap with a maximum offset of approximately three (3) to four (4) feet.

West side

The UPPER SPAN had sustained major damage, failed at the expansion hinge, and collapsed onto the lower deck. The support span remained in place with the bearing seat fractured away from the hinge diaphragm. The soffit fractured and had broken away where the west side hinge restrainer assembly pulled through. The overhang span had extensive diagonal cracking, and was torn away from the top slab from midspan to Bent 81.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface sustained major damage, with the failure of the hinge in the #1, #3, and #4, lanes. The #2 lane was partially failed at the hinge on the west side. The west hinge restrainer assembly pulled through the support span and caused extensive damage to the soffit and diaphragm, but remained attached to the overhang. The central restrainer remained intact, and the overhang diaphragm ripped away and remained connected to the support span, as the overhang span fell. The overhang span shifted southward over the lower hinge.

Bent 81

East side

The UPPER COLUMN had severed at the base, split vertically down its center, and collapsed, with the east side remaining attached to the upper cap. The west half of the column slipped down to the ground, and leaned up against the lower column. The base separated at the horizontal pinned connection joint, with the vertical dowels, and fractured keyway concrete, remaining attached. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 2/3 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck. It was shifted eastward and slightly north over the lower cap. There was contact fracture to the bottom of the cap, and spalling and fracture at the column connection. The cap continued its eastward translation after contacting the lower deck and pushed the lower parapet railing away from the deck.

The LOWER CAP sustained minor cracks at the column connection.

West side

The UPPER COLUMN severed at its base and collapsed, but remained attached to the upper cap. There was fracture to the approximate upper 1/3 of the column where it came in contact with the top of the lower cap and deck. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. The base of the column severed at the horizontal joint. The vertical dowels, and fractured portions of the keyway concrete, were attached and visible. The dowels were mostly clean and clear of concrete and were bent to the east.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the west face. The steel was bent westward at an approximate 45 degree angle.

The UPPER CAP sustained moderate damage, and had collapsed onto the lower deck. The cap was shifted to the east, and aligned longitudinally over the lower cap. The lateral offset was estimated to be between approximately four (4) and five (5) feet to the east. There was contact fracture along the cap bottom, and the Span 80 girders fractured away from the cap.

The LOWER CAP sustained minor cracks at the column connection, and a moderate diagonal crack located approximately 1/3 of the way from the west side. The remainder of the cap was undamaged.

Span 81

East side

The UPPER SPAN had sustained light to moderate damage and was shifted approximately four (4) to five (5) feet eastward, but remained suspended over the lower span. The soffit contacted the lower span hand railing and was punctured by the hand rail supports, then translated approximately an additional three (3) feet to the east and came to rest above the railing. Several sections of parapet railing were missing. They had apparently been removed during part of the rescue operations.

The LOWER SPAN was intact, but sustained minor damage to the parapet railing, which was broken out to the east at the bent caps.

West side

The UPPER SPAN had sustained moderate damage, and collapsed onto the lower roadway, forming a sag at midspan. The exterior girder was torn away from the top slab at the bent and extended approximately 15 feet northward. The separation was estimated at a maximum of four (4) feet at the bent cap. The girder was torn away from the soffit, to a lesser extent, at Bent 82. There was diagonal cracking in the exterior girder throughout the span.

The LOWER SPAN was intact, and had sustained light damage. There was light diagonal cracking in the exterior girder near the bents.

The UPPER SPAN ROADWAY surface sustained fracture to the pavement and top slab, in the #1 lane, at the bent. The #2 and #3 lanes were intact. There was broken pavement and a significant depression in the #4 lane near the bent cap.

Bent 82

East side

The UPPER COLUMN was severed at the top and base, and had collapsed. There was extensive fracture to the upper half of the column, which exposed the vertical reinforcement. The column separated along the horizontal pinned connection joint. The vertical dowels, and fractured keyway concrete, remained attached. The dowels were bent to the west and south.

The LOWER COLUMN was intact, but sustained with fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck. It had shifted approximately four (4) to five (5) feet eastward, and slightly north, over the lower cap. The cap had severed cleanly at the column connection. The top mat of reinforcing steel was exposed, where it hooked into the column. These hooks had a slight north bend. The cap continued its eastward translation after contacting the lower deck and pushed the lower parapet railing eastward approximately two (2) to three (3) feet, separating it from the deck slab. There was fracture to the bottom of the cap where it contacted the lower deck and railing.

The LOWER CAP had a slight sag, and light to moderate cracking throughout its length. There was spalled concrete at the column connections.

West side

The UPPER COLUMN severed at its base and collapsed, but remained attached to the upper cap. There was extensive fracture to the approximate upper 1/3 of the column, where it came in contact with the top of the lower cap and deck. The top portion of the column was fractured and rotated away from the cap face, and remained attached to the embedded cap steel. The base of the column severed at the horizontal joint. The vertical dowels, and fractured portions of the keyway concrete, were attached and visible. The dowels were mostly clean and clear of concrete and were bent to the east and south.

The LOWER COLUMN was intact, but sustained fracture to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 2/3 of the way down the west face. The bars were bent down and were in contact with the bottom of the upper column.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck eastward, and slightly north, over the lower cap. There was fracture to the bottom of the cap, where it contacted the lower deck and railing. There was a marked humping of the span as it crossed over the cap. There was extensive fracture at the column cap connection.

The LOWER CAP had a slight sag, and light to moderate cracking throughout its length. There was spalled concrete at the column connections.

Span 82

East side

The UPPER SPAN had contacted the lower rail, sustained light to moderate damage, and was shifted eastward approximately four (4) to five (5) feet. It remained suspended above the lower span. The soffit had puncture holes and scrape marks from the contact with the hand rail supports. There was an additional translation after the contact with the lower span, which was estimated to be approximately two (2) to three (3) feet to the east, and approximately six (6) inches to the north. There was a slight sag in the span, with the break points located at the bent and approximately 15 to 20 feet south of Bent 83. There was a moderately fractured area in the exterior girder at the cap connection, which extended into the top slab. There was moderate diagonal girder cracks, and fracture, to the soffit at approximately the 3/4 point along the span.

The LOWER SPAN was intact, but sustained light damage to the parapet and hand railing.

West side

The UPPER SPAN sustained moderate to major damage, and had collapsed onto the lower span. The span sloped sharply downward at the bent, and was torn from the bent cap at Bent 83. There was extensive damage to the girder, and top slab, at the north end of the span. The parapet railing was broken away for the entire span length.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface, in the #1 and #4 lanes, had severe depressions at the bent. The #2 and #3 lanes were intact.

Bent 83

East side

The UPPER COLUMN had severed at the base, split vertically down its center, and collapsed, with the east side remaining attached to the upper cap. The west half of the column separated and fell to the ground. The base separated at the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete remaining attached. The dowels remained encased in concrete. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out approximately 1/3 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck approximately four (4) to five (5) feet eastward, and slightly north, over the lower cap. The deck was slanted up toward the north as it crossed the cap. There was fracture to the bottom of the cap where it contacted the lower deck and railing.

The LOWER CAP sustained light cracks and spalling at the east side.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. There was extensive fracture to the approximate upper 1/3 of the column, which exposed the vertical reinforcement. The column separated along the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete remaining attached. The dowels were bent northward.

The LOWER COLUMN was intact, but sustained extensive fracture to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 2/3 of the way down the west face.

The UPPER CAP sustained moderate to major damage, and had collapsed onto the lower deck. It was shifted eastward and slightly south of the lower cap. There was extensive fracture to the bottom portion of the cap, where it contacted the lower deck and parapet railing. The portion of the top mat of cap reinforcement that hooked into the column was exposed and bent slightly northward. The span was humped over the cap.

LOWER CAP There was spalled concrete and diagonal cracking at the column on the west side. Approximately one (1) foot from the west column, there was a severe crack in the cap. The cap partially failed at this point, and was deflected down approximately one (1) to two (2) inches, with extensive diagonal cracking. The center portion was intact.

Span 83

East side

The UPPER SPAN had sustained moderate damage, failed at the hinge, and collapsed onto the lower parapet railing at the expansion hinge. The support span remained attached to the bent, and was suspended over the lower span. It sustained extensive damage to the hinge diaphragm. There was extensive fracture to the soffit where the east hinge restrainer assembly pulled through the support span. The support span hinge was shifted slightly north over the lower hinge. There was a approximate one (1) to two (2) foot separation in the hinge, with the overhang shifted to the south over the lower hinge. The overhang span was intact at the hinge and was resting on lower rail. It sloped back up, off the rail, at Bent 84. There was diagonal cracking in the exterior girder starting at approximately 10 feet from Bent 84 and moving north to the cap. There was moderate fracture to the girder at the Bent 84 cap. The span was shifted approximately four (4) to five (5) feet eastward over the lower span.

The LOWER SPAN was intact, but sustained light damage to the parapet railing and the support span hinge bearing seat. The section of rail at Bent 84 was broken free of the deck and shifted eastward approximately one (1) foot.

West side

The UPPER SPAN had sustained moderate to major damage, and collapsed onto the lower span. The span failed at the expansion hinge, with the overhang deflecting lower than the support span. There was extensive damage to the girder and top slab at the north end of the span. The parapet railing was broken away, over the bent caps, partially as a result of rescue operations.

The LOWER SPAN remained intact, and had sustained light damage at Bent 84. There was minor fracture and spalling to the soffit at the exterior girder, and light diagonal cracking in the girder from the approximate 3/4 point to Bent 84.

The UPPER SPAN ROADWAY surface sustained major damage to the support span roadway and expansion hinge. In the #1 and #2 lanes, the support span hinge diaphragm had extensive fracture which propagated back into the top slab. The support span hinge bearing seat was destroyed in this area which caused the overhang span to drop, creating an approximate two (2) to three (3) foot vertical offset, and making the #1 and #2 lanes impassable at the hinge. In the #3 lane, the damage appeared to be to the overhang hinge diaphragm, with a distortion to the deck line. The overhang joint header was raised above the rest of the hinge. The vertical separation decreased to several inches at that location. In the #4 lane, the damage appeared to be to the overhang diaphragm, with the support diaphragm intact, and a vertical offset of less than approximately one (1) foot.

Bent 84

East side

The UPPER COLUMN severed at the base below the pinned connection joint and had collapsed, but remained attached to the upper bent cap. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up, and westward, to the joint line. There was spalled concrete at the base, along the northeast corner of the joint. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was extensive fracture to the approximate top 1/2 of the column, where it came in contact with the lower portion of the bent. This damage extended through the column to the mid-east face, exposing the vertical reinforcement and fracturing away approximately 40% of the top half of the column. The exposed vertical steel had a slight eastward bend starting at the midpoint.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower deck. It had shifted eastward, and slightly south, over the lower cap. There was fracture to the bottom, which pushed the parapet rail east several inches, after it fell.

The LOWER CAP sustained light cracking at the column connection on the east side.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. There was extensive fracture to the top portion of the column. The column separated along the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete remaining attached. The dowels were bent northward.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was exposed and partially pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained major damage, and had collapsed onto the lower deck. It had shifted approximately one (1) to two (2) feet south and several feet eastward over the lower cap. The cap was extensively fractured on the west face and on the bottom, where it contacted the lower deck. There was extensive fracture to the top slab, and the deck formed a hump as it crossed the cap.

The LOWER CAP sustained light to moderate cracking, and spalled concrete, at the column on the west side. The center had no noticeable damage.

Span 84

East side

The UPPER SPAN collapsed, and had sustained light damage. It was shifted approximately three (3) to four (4) feet east and slightly north, but remained suspended over the lower span. The soffit had puncture holes from contact with the hand rail supports. There was an additional translation of the span after this contact, which was estimated to be approximately one (1) foot to the east and two (2) to four (4) inches to the north. There was a hole in the soffit, and fracture, at approximately six (6) feet north of the bent, which extended through the exterior girder diagonally. The soffit fracture extended back to the bent cap. There was diagonal cracking in the girder, and a tear at the soffit from the Bent 85 cap south approximately eight (8) to 10 feet. There was moderate fracture to the girder at the Bent 85 cap.

The LOWER SPAN was intact, but sustained minor damage to the parapet railing. The first section of railing separated from the top slab and translated eastward approximately six (6) inches at the bent, as a result of contact with the upper bent cap.

West side

The UPPER SPAN collapsed onto the lower span, and had sustained moderate to major damage. The span sloped down from the bents to the quarter points, where there was extensive damage to the girder. The parapet railing was removed as part of rescue operations.

The LOWER SPAN was intact, but sustained minor spalls to the soffit at the girder and light diagonal girder cracks. The cracks extended from the bents to approximately the 1/4 and 3/4 points. There was a moderate tear in the soffit, at the girder at Bent 85.

The UPPER SPAN ROADWAY surface sustained light damage, and humped over the bent cap in the #1 and #4 lanes.

Bent 85

East side

The UPPER COLUMN severed at the top and the base, and had collapsed to the ground. It was leaning against the lower column. The base failure occurred approximately two (2) feet below the the horizontal pinned connection joint, with the failure plane extending up, and westward, to the joint line. There was extensive fracture to the approximate top 1/2 of the column where it came in contact with the lower portion of the bent. This damage extended through the column to the mid-east face, exposing the vertical reinforcement, and fracturing away approximately 50% of the top half of the column. The exposed vertical steel had a slight eastward bend starting at the midpoint.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP collapsed onto the lower deck, and had sustained moderate damage. There was fracture to the south side, at the girder, and the bottom, where it contacted the lower deck and railing. The cap was shifted approximately six (6) inches to one (1) foot north, and approximately two (2) to three (3) feet east, over the lower cap.

The LOWER CAP sustained light to moderate cracking and spalls on the east side at the column connection.

West side

The UPPER COLUMN severed at the top and the base, and had collapsed to the ground, slightly north of, and leaning against, the lower column. The column fractured away from the upper cap and separated at the horizontal pinned connection joint at the base.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained major damage, and had collapsed onto the lower deck. It was shifted eastward, and slightly southward, over the lower cap. The upper span formed a hump as it crossed the cap.

The LOWER CAP sustained spalled concrete and a severe vertical crack through it, which extended into the soffit of Span 84, on the west side, at the column connection. No data was obtained from the central portion of the cap.

Span 85

East side

The UPPER SPAN collapsed onto the lower deck, and had sustained light to moderate damage. It shifted approximately two (2) to three (3) feet east, and slightly north, and remained suspended over the lower span. There was diagonal girder cracks and soffit fracture at the girder at the bent caps. The central portion of the span was smoke stained from a vehicle fire on the lower deck.

The LOWER SPAN was intact, and had sustained light damage. There were light diagonal cracks in the exterior girder near the bent caps and an approximate four (4) foot section of parapet rail was broken and shifted eastward at Bent 85.

West side

The UPPER SPAN sustained moderate damage, and was collapsed onto the lower span. There was extensive damage at approximately the quarter points where the span slumped down onto the lower deck. The span was humped over the bent caps, and the parapet railing had been removed as part of the rescue operations.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface had minor ramping at the bent cap in the #1 and #4 lanes. There was light damage to the #2 and #3 lanes.

Bent 86

East side

The UPPER COLUMN was severed at the top and base, and had collapsed, leaning up against the lower column. The approximate top 1/2 of the column had extensive core damage, with the east mat of vertical steel completely exposed and bent eastward at the midpoint. The base separation appeared to have occurred below the horizontal pinned connection joint. The top fractured along the column cap connection.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage and was collapsed onto the lower deck. It had shifted approximately two (2) to three (3) feet east, and was longitudinally aligned over the lower cap. There was fracture to the south side of the cap, and to the bottom where it contacted the lower parapet railing and deck.

The LOWER CAP sustained minor cracking throughout its length.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. It was leaning up against the bottom of the lower column. The top approximate 1/2 of the column had extensive fracture to the east face, and the vertical reinforcement was exposed. The base separation appeared to have occurred below the horizontal pinned connection joint. The top appeared to have fractured along the column cap connection.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained moderate damage and was collapsed onto the lower deck. It had shifted east of, and was longitudinally aligned over, the lower cap. The hooked portion of the top mat of cap steel had a slight south bend.

The LOWER CAP sustained light cracking throughout its length, with minor spalls at the west column connection.

Span 86

East side

The UPPER SPAN sustained light to moderate damage and was collapsed, but remained suspended over the lower span. The eastward shift of the span decreased towards Bent 87. There was minor contact damage to the soffit from the lower span hand rail supports. The support span had a slight downward deflection and a partial failure of the hinge bearing seat. The fracture extended from the hinge into the soffit, causing a tear back to the bent cap. There was light to moderate diagonal cracking in the support span exterior girder. There was moderate fracture and cracking in the exterior girder and a slight sag in the deck near Bent 87. The parapet railing was apparently removed during rescue operations.

The LOWER SPAN was intact, but sustained minor damage to the parapet rail and light diagonal cracking in the girder at the bents.

West side

The UPPER SPAN sustained light to moderate damage, and had collapsed onto the lower span. There was moderate damage to the support span, and the hinge diaphragm was shifted several inches south over the lower joint. The upper hinge was separated approximately six (6) to 12 inches, and the overhang diaphragm appeared to be aligned over the lower joint. The overhang span had a slight upward slope towards Bent 87, with fracture to the exterior girder and top slab at the cap.

The LOWER SPAN was intact, but sustained light diagonal cracking in the exterior girder near the bent caps. The expansion hinge was closed and appeared intact.

The UPPER SPAN ROADWAY surface, in the #1 and #2 lanes, had minor pavement cracks. There was a slight ramping in the #3 lane, from the hinge to the cap, which increased in the #4 lane. The hinge was intact in the #1 and #2 lanes, and had a slight separation and vertical offset in the #3 and #4 lanes.

Bent 87

East side

The UPPER COLUMN was severed at the top and base and had collapsed. The top was leaning up against the lower column. There was extensive damage to the west side, and the column appeared to be split vertically down the middle. The base separation appeared to have occurred below the horizontal pinned connection joint. There was moderate spalling to the base directly above the horizontal joint. The top fractured along the column cap connection.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower span. It appeared to have a slight northward shift and an approximate one (1) foot eastward shift over the lower cap. The cap had a slight northward twist.

The LOWER CAP sustained light cracking and spalls at the column connection on the east side, with the cracks increasing in severity towards the center of the cap. There appeared to be a slight sag in the cap.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. The top was leaning up against the lower column. There was extensive damage to the east side, and the column appeared to be fractured vertically down the middle. The base separation appeared to have occurred below the horizontal pinned connection joint. There was a moderately spalled area at the northwest corner, directly above the joint.

The LOWER COLUMN was intact, but sustained fractures to the top, and the exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the west face.

The UPPER CAP sustained moderate damage, and was collapsed onto the lower span. It had shifted eastward, and slightly north, over the lower cap. There was extensive fracture at the girder connections, and the deck formed a slight hump over the cap.

The LOWER CAP had sustained minor cracking at the column connection on the west side.

Span 87

East side

The UPPER SPAN collapsed, and had sustained light to moderate damage. It remained suspended over the lower span, with a slight sag which started several feet from the bent caps. The span formed a slight hump over the bent cap. There was moderate diagonal cracking in the girder, and soffit fracture, from the bent northward approximately 15 feet. There was light to moderate diagonal cracking in the girder at the north end. The girder was fractured at Bent 88, with the damage extending into the soffit and top slab. The eastward lateral span shift continued to decrease. The parapet railing was apparently removed during rescue operations.

The LOWER SPAN was intact, but sustained light diagonal cracking near the bents.

West side

The UPPER SPAN sustained moderate damage similar in nature to the east side. The span sag was slightly more pronounced than on the east. The parapet railing was broken away at the bent cap. The remainder of the missing rail had apparently been removed during rescue efforts.

The LOWER SPAN was intact, but sustained light diagonal cracking in the exterior girder near the bent.

The UPPER SPAN ROADWAY surface was flat, with minor cracking. All lanes were intact and passible.

Bent 88

East side

The UPPER COLUMN severed at the base, split vertically down its center, and collapsed, with the east side remaining attached to the upper cap. The west half of the column slipped down to the ground. The base separated at the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete remaining attached. There was spalled concrete at the base, directly above the joint, and the exposed dowels appeared straight. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained fracture to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP had sustained light to moderate damage, and was collapsed onto the lower deck. It was laterally aligned, and shifted slightly north, over the lower cap.

The LOWER CAP sustained a moderate crack at the column.

West side

The UPPER COLUMN had severed at the top and the base and collapsed to the ground. It was leaning against the lower column. The base separated at the the horizontal pinned connection joint, and the fractured keyway concrete remained attached. There was extensive fracture to the approximate top 1/3 of the column, where it attached to the cap, and where it came in contact with the lower portion of the bent. This damage extended through the column to the east face, exposing the vertical reinforcement, and fracturing away approximately 60% of the top half of the column.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the west face.

The UPPER CAP had sustained moderate damage, and was collapsed onto the lower deck. It came to rest slightly north, over the lower cap. There was extensive fracture to the bottom portion of the cap, where it had contacted the lower parapet and deck.

The LOWER CAP sustained a major crack, and an approximate one (1) to two (2) inch vertical failure of the cap on the west side at the column. The center of the cap was undamaged.

Span 88

East side

The UPPER SPAN had collapsed and sustained light to moderate damage. It remained suspended over the lower span, with a slight sag which started several feet from the bent caps. The span formed a slight hump over the bent cap. There was moderate diagonal cracking in the girder, and soffit fractures, from the bent northward approximately 12 feet. There was light to moderate diagonal cracking in the girder at the north end. The girder was fractured at Bent 88, with the damage extending into the soffit and top slab. The span appeared to be laterally aligned over the lower span. The parapet railing was apparently removed during rescue operations.

The LOWER SPAN was intact, but sustained light diagonal cracking near the bents.

West side

The UPPER SPAN had sustained moderate damage, and was collapsed onto the lower deck near the bent. There was extensive damage at this failure point, which extended from the bent for approximately 15 to 20 feet. The roadway surface appeared to slope back up as it approached Bent 89, but the fracture in the girder, and tearing in the soffit at the north end, indicated that the girders and soffit had torn away from the Bent 89 cap and remained on top of the lower span.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface appeared to be passable in all lanes.

Bent 89

East side

The UPPER COLUMN had severed at the base and collapsed, with the east side remaining attached to the upper cap. The base separated at the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete remaining attached. The dowels remained encased in concrete. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was extensive fracture to the top of the column, and the west face, where it contacted the lower deck and cap. The east face was intact, but approximately 70% of the total column fractured away.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/4 of the way down the east face.

The UPPER CAP sustained light to moderate damage and was collapsed onto the lower span. It appeared to be longitudinally and laterally aligned over the lower cap.

The LOWER CAP sustained minor spalls at the column connection and light diagonal cracking along the east third of the cap.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. The column was lightly damaged with fracture to the top, where it separated from the cap. The column separated along the horizontal pinned connection joint, and the vertical dowels and fractured keyway concrete remained attached.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained moderate damage, and was collapsed onto the lower span. It appeared to be longitudinally and laterally aligned over the lower cap.

The LOWER CAP sustained light cracking at west column connection. The center section was intact.

Span 89

East side

The UPPER SPAN sustained light to moderate damage and a partial failure of the support span that resulted in a angular sag at the expansion hinge. There was spalling and fracture in the exterior girder at the bent, which extended into the top slab and soffit. The overhang span angled upward towards Bent 89, and there was diagonal girder cracking and a tear in the soffit near the cap. The hinge was longitudinally aligned over the lower hinge.

The LOWER SPAN was intact, but sustained light diagonal cracks in the exterior girder near the caps.

West side

The UPPER SPAN sustained moderate damage and was collapsed onto the lower span. There was extensive damage to the expansion hinge, with the damage being more severe to the overhang portion. There was extensive fracture to the girder at the bent cap, and the support span angled downward to the hinge. The overhang span was on the lower deck and appeared to be laterally offset several inches west of the support span. There were diagonal cracks in the girder, and fracture to the top slab, near Bent 90.

The LOWER SPAN was intact, but sustained fractures to the parapet rail immediately north of the hinge, and contact damage to several of the hand rail supports at midspan.

The UPPER SPAN ROADWAY surface had a ramp rising from the hinge to the cap, which was caused by the support span failure. The hinge joint was intact and closed. The ramping would have created a partial barrier for traffic in all lanes.

Bent 90

East side

The UPPER COLUMN had severed at the base, split vertically down its center, and collapsed, but the east side remained attached to the upper cap. The west half of the column fractured from top to base and separated and fell to the ground. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up and westward to the joint line. The dowels remained encased in concrete. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained extensive fracture to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP collapsed onto the lower span, and had sustained light to moderate damage. It was longitudinally aligned and shifted slightly westward over the lower cap.

The LOWER CAP sustained minor spalls, and moderate diagonal cracking, on the east side. The cracking increased in intensity towards the middle of the cap, with a severe crack extending up, and westward, through the cap and into the soffit. There was a slight vertical deflection in the cap at this location.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. Its top was leaning up against the lower column. There was extensive damage to the east side of the column, from the top to the midpoint. The base separation appeared to have occurred below the horizontal pinned connection joint. There was minor fracture to the northwest corner of the base, directly above the horizontal joint. The top fractured along the column cap connection.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained moderate to major damage, and was collapsed onto the lower deck. It had shifted slightly to the west and longitudinally aligned over the lower cap.

The LOWER CAP sustained light diagonal cracks along the west side at the column, and minor spalls at the column connection. The center portion was undamaged.

Span 90

East side

The UPPER SPAN sustained light to moderate damage, and had a slight angular sag, approximately eight (8) to 10 feet north of the bent. There was extensive fracture in the exterior girder at the cap, and moderate diagonal cracks running from the cap to the sag point. The parapet railing fell away, over the bent. The span sloped upward slightly towards Bent 91. There were light diagonal girder cracks near Bent 91.

The LOWER SPAN was intact, but sustained light diagonal girder cracks near the bent and fracture to end of the parapet rail at Bent 91. There was a portion of the parapet apparently removed during rescue operations.

West side

The UPPER SPAN sustained light to moderate damage, and formed a sag at the approximate 1/4 and 3/4 points along the span. There were moderate to severe diagonal girder cracks north of the bent at the sag point. There was extensive fracture to the girder at Bent 91 and light to moderate diagonal cracks extending south to the sag point. The parapet was broken away from the sag points, back to each bent.

The LOWER SPAN was intact, but sustained minor contact damage to several of the parapet hand rail support anchorages.

The UPPER SPAN ROADWAY surface had a slight humping in the roadway in the #1 and #4 lanes at the bent cap. The other lanes were intact with no damage noticed.

Bent 91

East side

The UPPER COLUMN was severed at the top and base, and had collapsed. It was leaning against the bottom of the lower column. The upper half of the column was destroyed and the vertical reinforcement was exposed and bent. The east mat of vertical reinforcement had a sharp eastward bend. The column separated approximately two (2) to three (3) feet below the horizontal pinned connection. The failure plane extended up, and westward, to the joint line, and included the vertical dowels.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained moderate damage and was collapsed onto the lower deck. It came to rest slightly west, and approximately one (1) to two (2) feet north, over the lower cap. There was extensive fracture to the bottom portion of the cap, where it came in contact with the parapet and lower deck.

The LOWER CAP sustained light to moderate diagonal cracking along the east side.

West side

The UPPER COLUMN severed at the top and the base, and had collapsed to the ground. It was leaning against the bottom of lower column. The base separated at the horizontal pinned connection joint, and the fractured keyway concrete remained attached. There was extensive fracture to the east side of the column, from the top, to just above the base. The damage extended almost completely through to the west face, where the column attached to the cap, and where it came in contact with the lower portion of the bent.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained moderate to major damage, and was collapsed onto the lower deck. The cap had extensive fracture, and was shifted approximately one (1) to two (2) feet north, and approximately one (1) foot west, over the lower cap.

The LOWER CAP sustained minor spalls at the west column connection. No data was obtained for the center section.

Span 91

East side

The UPPER SPAN collapsed, and had sustained light to moderate damage. It remained suspended over the lower span, but had a slight sag which started several feet from the bent caps. There was moderate diagonal cracking in the girder, and soffit fracture, from the bent northward approximately 12 feet. There was light to moderate diagonal cracking in the girder at the north end. The girder was fractured at Bent 92, with the damage extending into the soffit and top slab. The parapet railing was apparently removed during rescue operations.

The LOWER SPAN was intact, but sustained light diagonal cracking near the bents.

West side

The UPPER SPAN sustained light to moderate damage, and formed a sag at the approximate 1/4 and 3/4 points along the span. There were moderate diagonal girder cracks north of the bent, at the sag point, and extensive fracture to the girder at the cap. At the north sag point, there was extensive girder fracture at the top slab, and severe diagonal cracking. The center portion of the span appeared to have contacted the lower deck. The parapet rail was broken away from the top slab and was missing throughout the span. The deck formed a slight hump as it crossed over the bent.

The LOWER SPAN was intact, but sustained light diagonal cracking near the bents. There was contact damage to the south end of the parapet rail at the hand rail support assemblies.

The UPPER SPAN ROADWAY surface sustained light to moderate longitudinal cracks in the roadway, which would not have affected travel. There was a slight hump over the bent cap in the #4 lane. The other lanes were intact.

Bent 92

East side

The UPPER COLUMN severed at the top and base, and had collapsed. It was leaning against the top, and shifted slightly north, of the lower column. There was extensive fracture to the approximate top 1/2 of the column, on the west side, which almost extended through to the east face. The upper

1/2 of the vertical reinforcement was exposed. The column separated approximately two (2) to three (3) feet below the horizontal pinned connection joint, with the failure plane extending up, and westward, to the joint line. The vertical dowels were encased in concrete and attached to the column base.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower deck. It came to rest slightly north over the lower cap. The caps appeared to be laterally aligned.

The LOWER CAP appeared to have light diagonal cracking on the east side, which extended towards the center.

West side

The UPPER COLUMN severed at the top and base, and had collapsed to the ground. The column was leaning up against the pulled away exterior mat of lower column vertical reinforcement. The top half of the column was completely fractured away from the midpoint, on the east side, diagonally to the top west corner. The vertical reinforcement was completely exposed and appeared to be straight. The base was separated at the horizontal pinned connection joint, and there was fracture to the northwest corner above the joint.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower deck. It came to rest slightly north over the lower cap. The caps appeared to be laterally aligned.

The LOWER CAP sustained light cracks and minor spalls on the west side at the column connection. There was no data recorded for the center of the cap.

Span 92

East side

The UPPER SPAN sustained light to moderate damage, with a failure at the expansion hinge that resulted in the overhang collapsing onto the lower span. The support span hinge diaphragm was destroyed, and the soffit was fractured back to the bent. There was fracture to the overhang hinge diaphragm, and the span sloped back up off the lower deck towards Bent 93. There were light to moderate diagonal girder cracks, which aligned with a downward slope in the overhang span located approximately 10 to 12 feet south of Bent 93. The cracks extended into the soffit, which was spalled back to the bent.

The LOWER SPAN was intact, and had no damage recorded.

West side

The UPPER SPAN failed at the expansion hinge, and had sustained moderate damage. The overhang span was collapsed onto the lower deck, and was offset from the support span several inches west. There was extensive fracture, and diagonal girder cracking, at Bent 93, where the top slab rose back up over the cap, and the span remained on the lower deck. There was extensive fracture at the bent cap. The support span angled down sharply towards the hinge. The parapet rail was broken away from the top slab and missing throughout the span.

The LOWER SPAN sustained light to moderate damage, with a partial failure at the expansion hinge. There was contact damage to the hand rail support assemblies. The parapet rail, to the north of the expansion hinge, had an approximate 12 foot long fracture at its base, from what appeared to be contact from the upper overhang span. The overhang deflected down approximately two (2) inches at the hinge. There was contact damage to the overhang hinge seat, and fracture to the support hinge seat and soffit. There was a diagonal fracture on the span located approximately eight (8) feet from Bent 93, which ran from the top slab northward into the soffit. There was a vertical offset of approximately two (2) inches at this location, with the south side of the span lower than the north side of the span.

The UPPER SPAN ROADWAY surface had sustained severe damage. The support span hinge was essentially destroyed in the #1, #2, and #3 lanes, with a vertical offset of several feet above the overhang span. This offset decreased towards the #4 lane due to a collapsing of the support span on the west side. The vertical offset created a barrier to travel in the #1 and #2 lanes, but the support span collapse was such that the #3 and #4 lanes may have been passable to traffic.

Bent 93

East side

The UPPER COLUMN had severed at the base below the pinned connection joint and collapsed, but remained attached to the upper bent cap. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up, and westward, to the joint line. There was spalled concrete at the base along the northeast corner of the joint. The top portion of the column was fractured and had rotated away from the cap face, but remained attached by the embedded cap steel. There was extensive fracture to the approximate top 1/2 of the column, where it came in contact with the lower portion of the bent.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage, and collapsed onto the lower span. It came to rest approximately one (1) foot north, and slightly west, over the lower cap.

The LOWER CAP sustained diagonal cracking and minor spalls at the column connection. The cracking extended toward the center.

West side

The UPPER COLUMN severed at the base and collapsed, but the top remained attached to the upper cap. The base separated at the horizontal pinned connection joint, and the vertical dowels and fractured keyway concrete remained attached. The dowels were partially encased in the keyway concrete. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was moderate fracture to the approximate upper east 1/2 of the column, where it separated from the cap, and where it came in contact with the lower deck and parapet rail.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/4 of the way down the west face.

The UPPER CAP sustained light to moderate damage and collapsed onto the lower span. It came to rest approximately one (1) foot north, and approximately one (1) foot west, over the lower cap.

The LOWER CAP sustained light diagonal cracking and minor spalls at the column connection. The cracking extended towards the center. The center of the cap appeared undamaged.

Span 93

East side

The UPPER SPAN sustained light damage, and collapsed, but remained suspended over the lower span by the bent caps. There was a slight sag in the span, which started several feet from the bents. There was light to moderate diagonal cracking, and fracture, to the top slab at the sag points. There was a slight hump in the deck as it crossed the bent cap.

The LOWER SPAN was intact, but sustained light damage. There appeared to be a soffit spall, and diagonal cracking, near Bent 94. There was damage to the parapet railing that appeared to be from the rescue operations.

West side

The UPPER SPAN collapsed onto the lower span and sustained moderate damage. The soffit and top slab was torn, and there was fracture and diagonal cracking in the exterior girder at the bent. The deck formed a slight hump across the cap, and the parapet railing was missing at this location. The deck angled down sharply from Bent 94 to a sag point approximately 18 to 20 feet south of the bent. The girders and soffit fractured away from the Bent 94 cap and remained on the lower deck, creating a soffit tear that extended to the sag point.

The LOWER SPAN was intact, but sustained light damage. There was diagonal cracking in the exterior girder near Bent 94. Portions of the parapet railing were apparently removed during rescue operations.

The UPPER SPAN ROADWAY surface sagged across the span, with the resulting hump at the bent caps creating difficulty for the passage of traffic.

Bent 94

East side

The UPPER COLUMN severed at the base, below the pinned connection joint, and collapsed, but remained attached to the upper bent cap. The column had a marked north shift, and was twisted slightly counterclockwise. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up, and westward, to the joint line. There was no evidence of spalled concrete at the base joint. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was extensive fracture to the approximate top 2/3 of the column. This damage extended diagonally upward from the west face to approximately 3/4 of the way through the column at the top. The vertical reinforcement was exposed, and had been pulled and bent southward.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face. This steel had an outward and northward bend, with a north twist that aligned with the position of the upper column base.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower deck. It appeared to be shifted approximately two (2) to three (3) feet north, and slightly west, over the lower cap.

The LOWER CAP was intact, and had no apparent damage

West side

The UPPER COLUMN severed at the base and top and collapsed to the ground, and was leaning up against the lower column. The column had been split vertically up its center, with the east side fractured away, and a portion of the vertical reinforcement remained attached to the upper cap.

The LOWER COLUMN was intact, with fracture to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained moderate damage, and was collapsed onto the lower deck, approximately one (1) to two (2) feet north, and slightly west, over the lower cap. There was extensive fracture to the bottom, and south face, of the cap. A portion of the inside of the top of the column remained attached to the cap, and contained several of the column's vertical reinforcing bars.

The LOWER CAP was intact, and had no damage apparent.

Span 94

East side

The UPPER SPAN sustained light damage, and collapsed, but remained suspended over the lower span by the bent caps. There were light diagonal girder cracks extending throughout most of the span. There was a tear in the soffit at the exterior girder, which extended approximately 10 to 15 feet from the bent. There was extensive girder fracture at the cap, and a slight sag in the deck at the bent, which gently sloped up towards Bent 95.

The LOWER SPAN was intact, and had no damage apparent.

West side

The UPPER SPAN sustained light damage, and collapsed, but remained suspended over the lower span by the bent caps. There was a slight sag in the span near Bent 95, and moderate diagonal fracture in the girder that extended into the soffit. There was light diagonal cracking in the girder north of the bent.

The LOWER SPAN was intact, and had no apparent damage. Portions of the parapet railing had apparently been removed during rescue operations.

The UPPER SPAN ROADWAY surface was intact and level, with no damage recorded.

Bent 95

East side

The UPPER COLUMN fractured at its base and had partially collapsed. The column slipped out, northward, from under the cap, at the horizontal pinned connection joint. The vertical dowels were bent south and flat against the column top. The top of the column was intact, with minor spalling along the south side at the horizontal joint. The column collapsed down along the north face of the lower column, with its top resting several feet north and above the top of the lower column. The bottom portion of the column remained attached to the lower column by the vertical reinforcement, which had a reverse "S" bend caused by the column's northward fall.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior (east) mat of vertical reinforcement was pulled out, approximately 1/4 of the way down from the top. The steel was pulled out further down the column on the north side, and formed a sloped fracture line along the east face.

The UPPER CAP sustained light damage, and was collapsed onto the lower span, approximately two (2) to three (3) feet north, and slightly west, over the lower cap. The bottom portion of the cap was fractured at the column connection.

The LOWER CAP was intact, and had no apparent damage.

West side

The UPPER COLUMN severed at the top and base, and had collapsed, with the top falling slightly north of the lower column. The interior (east) mat of vertical reinforcement was pulled away from the column face and remained attached to the top of the lower column. This steel was bent down and northward and made a "U" bend back up. The exterior mat of vertical reinforcement remained attached to the fractured column base, and to the lower column.

The LOWER COLUMN was intact, but sustained fractures to the upper portion, and the exterior mat of vertical reinforcement was pulled away from the west face, approximately 1/3 of the way down from the top.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet north, and slightly west over the lower cap. There was light damage to the bottom where it contacted the lower parapet and deck, and fracture to the lower west end, where the vertical dowels and keyway separated.

The LOWER CAP was intact, and had no apparent damage.

Span 95

East side

The UPPER SPAN sustained major damage, with a failure and separation of the expansion hinge. The overhang span collapsed onto the lower deck, and was broken away from Bent 96 about 3/4 of the way along its length. The portion attached to Bent 96 remained in place, and the broken section fell approximately two (2) to three (3) feet east, and five (5) to six (6) feet north, over the lower span, with the exterior girder overlapping the parapet railing. The reinforcing steel, that remained attached to both sides of the broken span, held the north end of the collapsed section five (5) to seven (7) feet off the lower deck. There was extensive damage to the bottom portion of the overhang span hinge diaphragm, where the hinge restrainer assembly pulled through. The support span was attached to the bent cap, and remained suspended over the lower deck. The hinge restrainer assembly was connected to the span, with the overhang diaphragm anchor hanging from the support diaphragm. The support span hinge bearing seat appeared to be intact.

The LOWER SPAN was intact, but sustained contact damage to the parapet railing and diagonal girder cracks near the bents.

West side

The UPPER SPAN sustained major damage, and was collapsed onto the lower span. The damage was similar in nature to the east side of the span. The overhang span was offset east, and north, from the support span. The hinge restrainer assembly appeared to have pulled straight out of the overhang hinge diaphragm. The top part of the cable holes in the support diaphragm were spalled.

The LOWER SPAN was intact, and had no recorded damage.

The UPPER SPAN ROADWAY surface had sustained severe damage. All lanes were impassable due to the failure of the span and separation of the hinge. The overhang span was broken approximately 15 to 20 feet south of Bent 96. The break was irregular, with the soffit fractured closer to Bent 96 than the upper slab and girders. The south side of the overhang span fell and remained attached to the standing section by the top slab and girder reinforcement. The north edge of the broken span was held off the lower deck approximately five (5) to seven (7) feet by this steel. The transverse reinforcing steel, between both sides of the break, was sloped down to the west, while the longitudinal steel was sloped down and east. It appeared from this, that the overhang broke, and collapsed, from west to east. The broken off span translated approximately six (6) feet north, moving under the portion attached to Bent 96. There were scrape marks on the lower deck, at the hinge, that indicated the overhang was dragged approximately three (3) to four (4) feet northward after it collapsed. The hinge had separated approximately five (5) to six (6) feet. The bearing seats appeared to be intact. The support span hinge translated approximately two (2) feet north, over the lower hinge. The overhang span was offset approximately one (1) to two (2) feet east of the support span.

Bent 96

East side

The UPPER COLUMN remained in place. There were minor spalls at the horizontal pinned connection joint, and light cracking in the column top. There was severe diagonal cracking, which extended down and eastward from the west side of the base. There was light diagonal cracking extending from the base into the top of the lower cap, at the column connection.

The LOWER COLUMN was intact, with severe cracking in the top, at the base of the upper column. These cracks went diagonally down from west to east, and the edges were spalled.

The UPPER CAP remained in place, with minor spalls and diagonal cracking at the column connection. There was no apparent longitudinal or lateral shift.

The LOWER CAP sustained diagonal cracking on the east side between the east and center column.

West side

The UPPER COLUMN remained in place, with minor spalling at the upper cap connection and light diagonal cracking at the base.

The LOWER COLUMN remained intact, with light diagonal cracking at the top.

The UPPER CAP was in place, with minor spalls and cracking at the column connection.

The LOWER CAP sustained a vertical crack at the west column connection.

Span 96

East side

The UPPER SPAN was in place and intact, and had no noticeable damage.

The LOWER SPAN was intact, and had no noticeable damage.

West side

The UPPER SPAN was in place, but sustained light diagonal cracking in the exterior girder at the approximate 1/3 points along the span.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was in place and intact between the bents.

Bent 97

East side

The UPPER COLUMN was in place and intact.

The LOWER COLUMN was intact, but sustained light to moderate cracking that extended down from the top west side, diagonally to the east face, and eastward to the top of the lower cap at the column connection

The UPPER CAP was in place, but had a slight north, and east, shift over the upper column.

The LOWER CAP sustained light to moderate cracking and spalls at the east column connection.

West side

The UPPER COLUMN was in place, with light to moderate cracking on the east side. Vertical cracks extended down the north, and south, faces from the upper cap connection. There was diagonal cracking on the top of the east, and north, face that extended down several feet to the northeast corner. There was a light diagonal crack which started on the east face, several feet above the base, and extended up, and into, the west face.

The LOWER COLUMN was intact, with diagonal cracking and surface spalls extending into the lower cap at the column connection.

The UPPER CAP sustained light damage and was shifted approximately two (2) inches north, and approximately one (1) inch east, on top of the upper column. The bottom of the cap had moderate fracture and spalling on the south face, at the column connection.

The LOWER CAP sustained light to moderate cracking and spalls at the west column connections. There was no damage noticed along the center portion.

Span 97

East side

The UPPER SPAN sustained major damage, and was collapsed onto the lower span. The span was broken approximately 16 to 20 feet north of the bent. The southern portion of the span remained attached to the bent, while the remainder fell onto the lower deck with Bent 98. The parapet rail was extended over the break point from the bent. The collapsed section was offset to the west, and sloped upward and rose off the lower deck at Bent 98.

The LOWER SPAN was intact, but sustained extensive fracture to the exterior girder and soffit at the connection to the cap at Bent 98. The fracture extended south several inches, and appeared to be a result of contact from the upper cap of Bent 98.

West side

The UPPER SPAN sustained major damage, and was collapsed onto the lower span. The span was broken approximately eight (8) to 12 feet north of the bent. The southern portion of the span remained attached to the bent, while the remainder fell onto the lower deck with Bent 98. The parapet rail was extended over the break point from the bent. The collapsed section was offset to the west, overlapped the lower parapet rail at midspan, and aligned inside the rail at Bent 98. The span sloped upward and rose off the lower deck at Bent 98.

The LOWER SPAN was intact, but sustained contact damage to the parapet railing.

Span 97

The UPPER SPAN AND ROADWAY surface was impassable in all lanes due to the failure of the span north of the bent. The span was broken approximately five (5) to 20 feet north of the bent. The break was irregular, with the soffit fractured closer to the bent than the upper slab and girders. The north side of the span fell, but remained attached to the standing section by the top slab and girder reinforcement. The transverse reinforcing steel, between both sides of the break, was sloped down to the east while the longitudinal steel was sloped down and west. It appeared from this that the span broke and collapsed from east to west. The broken off span translated several feet south, under the portion that remained attached to the bent.

Bent 98

East side

The UPPER COLUMN severed at the top and base, and had collapsed. The top fell several feet south of the lower column. The interior (west) mat of vertical reinforcement was pulled away from the column face, but remained attached to the top of the lower column. This steel was bent down and southward, and made a "U" bend back up. The exterior mat of vertical reinforcement remained attached between the fractured column base and the lower column. There was extensive fracture to the approximate bottom 1/2 of the column, which was leaning against the bottom of the lower column. The top of the column was intact, with the lower east portion of the upper cap attached by the vertical dowels.

The LOWER COLUMN was intact, but sustained fractures to the upper portion. The exterior mat of vertical reinforcement was pulled away from the east face, approximately 1/3 of the way down from the top.

The UPPER CAP sustained moderate damage, and was collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet south, and approximately one (1) to two (2) feet west, over the lower cap. There was light to moderate damage to the bottom where it contacted the lower parapet and deck, and fracture to the lower east end where the vertical dowels and keyway separated.

The LOWER CAP sustained light to moderate cracking at the east column connection.

West side

The UPPER COLUMN severed at the top and fractured at the base, partially collapsing and falling southward. There was extensive fracture to the lower east side where it fractured away from the lower column. The column base translated westward on top of the bent vertical reinforcement. The column slipped approximately 1/3 of the way down the lower column, with the top rotating southward and out from under the upper cap. The vertical reinforcement remained attached between the columns and was bent and pulled away from the lower east face of upper column.

The LOWER COLUMN was intact with fracture to the top. The exterior mat of vertical reinforcement pulled away from the west face, approximately 1/4 of the way down from the top.

The UPPER CAP sustained light damage, and was collapsed onto the lower span three (3) to four (4) feet south, and approximately one (1) to two (2) feet west, over the lower cap. There was fracture to the lower west face at the column connection.

The LOWER CAP sustained light to moderate cracking at the west column connection. There was no noticeable damage near the center column.

Span 98

East side

The UPPER SPAN sustained moderate damage, was separated at the expansion hinge, and was collapsed onto the lower span. The deck sloped upward, to the north, across the bent cap. The support span had minor damage at the hinge and remained attached to the bent, suspended over the lower span. There was extensive damage to the overhang span at the hinge, with fracture to the diaphragm where the cable restrainer assembly pulled through, and remained attached to, the support span. The overhang span was resting on top of the lower deck and had a slight upward slope towards Bent 99. There was extensive fracture to the exterior girder and top slab at Bent 99.

The LOWER SPAN was intact, but sustained light to moderate diagonal girder cracks and a tear in the soffit at the girder from the approximate 2/3 point along the span to Bent 99.

West side

The UPPER SPAN sustained light to moderate damage, was separated at the expansion hinge, and collapsed onto the lower span. The deck sloped upward, to the north, across the bent cap. The support span had minor damage at the hinge and remained attached to the bent, suspended over the lower span. It was shifted westward over the top of the lower parapet railing. The overhang span collapsed onto the lower deck and had extensive damage to the hinge diaphragm. It was offset west of the support span, overlapping and covering the parapet rail to midspan, then shifted slightly eastward and sloped up over the top of the parapet at Bent 99. There was diagonal girder cracks and an approximate six (6) foot section of spalled soffit located approximately 10 to 15 feet south of Bent 99. The parapet railing was completely broken away from the overhang span. The hinge had several feet of separation and was shifted to the south, with the overhang resting several inches south over the lower hinge.

The LOWER SPAN was intact, but sustained light to moderate damage. There was a moderate diagonal crack in the exterior girder, which extended into the soffit approximately 10 to 12 feet south of Bent 99. The fracture extended up, and southward, from the soffit through the parapet railing. The south side of the fractured span was vertically offset approximately one (1) to two (2) inches lower than the north side.

The UPPER SPAN ROADWAY surface was flat, however, all lanes were impassable due to the horizontal and vertical offset at the failed expansion joint. The bearing seats on both sides of the hinge had light damage. The west cable restrainer was severed and remained within the hinge diaphragms. There was spalling to the top of the east support span restrainer cable ports. The joint header was broken back and away from the west side of the overhang span.

Bent 99

East side

The UPPER COLUMN was severed at the top and base, and had collapsed southward. The top was leaning up against the lower column. There was extensive damage to the west side, and the column appeared to be split vertically down the middle. The base separation occurred at the horizontal pinned connection joint, and the vertical dowels, and fractured keyway concrete, remained attached to the base. The top fractured along the column cap connection.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained moderate to major damage, and was collapsed onto the lower span. It was longitudinally aligned and laterally shifted westward over the lower cap with a slight south tilt.

The LOWER CAP sustained light cracking and spalls at the column connection. This cracking increased in intensity toward the center.

West side

The UPPER COLUMN severed at its base and collapsed, but remained attached to the upper cap. The column had a northward tilt. The base separated at the horizontal pinned connection joint, and the vertical dowels, and fractured keyway concrete, remained attached. The dowels were partially encased in concrete and had a southward bend. The top portion of the column was fractured along the connection with the cap. There was moderate fracture to the upper east side of the column where it contacted the lower deck and cap. The top of the column had moderate fracture.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage and was collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet west, and slightly south, over the lower cap. The cap had a slight southward tilt, which aligned with the slope of the deck as it crossed the bent.

The LOWER CAP sustained light cracking an spalls at the column connection. There was also light cracking from the center to the west side. There was severe cracking and a slight sag in the center of the cap.

Span 99

The UPPER SPAN sustained moderate damage, and was collapsed onto the lower span. The parapet railing was missing, and there was extensive damage to the approximate first 20 feet of the span. The deck formed a hump north of the bent. The high point was located approximately five (5) feet north of the bent cap. The exterior girder was severely torn north of this point and separated from the top slab. This break in the span extended approximately another eight (8) to 10 feet north along a downward slope in the deck. At this location, the span started a slight rise back up, and came off the lower deck at Bent 100. There was light to moderate diagonal cracking in the girder along this section, and moderate fracture in the girder and top slab at Bent 100.

The LOWER SPAN was intact with, light to moderate diagonal cracking in the exterior girder at Bent 100 and directly below the break in the upper span north of Bent 99.

West side

The UPPER SPAN sustained moderate to major damage, and was collapsed onto the lower span. The span was shifted to the west, and had contacted the lower parapet railing, but the shift decreased towards a neutral lateral alignment at Bent 100. The span was intact across the bent cap, suspended over the lower span, and sloped upward from Span 99. At approximately eight (8) feet north of the cap, the top slab was fractured and angled sharply downward. The span was broken at this location. The girder was fractured and separated from the top slab, was thrust southward approximately one (1) to two (2) feet under the soffit, and was collapsed onto the lower deck. The tear in the top slab extended approximately eight (8) to 12 feet north, to the bottom of the deck sag, where it attached back to the girder. The deck was level across midspan then sloped back up from the approximate 3/4 point to Bent 100. There was light to moderate fracture and diagonal girder cracks at the slope transition, and fracture at the cap connection at Bent 100. There was one section of parapet rail that remained intact, located at midspan.

The LOWER SPAN sustained moderate damage. There was fracture and light diagonal cracking in the exterior girder, at the bent. There was also diagonal cracking and fracture, located approximately 10 feet from each of the bents. The cracks were sloped upwards and towards midspan and extended through the exterior girder into the soffit. There was exposed reinforcement at the junction of the soffit and the girder, and there appeared to be a slight sag in the central portion of the span. There was damage to the top of the parapet railing, at the hand rail anchorage assemblies, and a portion of the rail was broken away on the south central side of the span.

The UPPER SPAN ROADWAY surface was rendered impassable by the fracture in the span just north of the bent. The north portion was collapsed and thrust under the approximate eight (8) to 10 foot section attached to the bent cap, creating a vertical ridge across the span which was in excess of four (4) feet high.

Bent 100

East side

The UPPER COLUMN severed at the base, split vertically down its center, and collapsed, with the east side remaining attached to the upper cap. The west half of the column fell to the ground. The base failure occurred approximately two (2) to three (3) feet below the horizontal joint, with the failure plane extending up, and westward, to the joint line. The vertical dowels were encased in concrete and attached to the column, and there were minor spalls at the base, directly above the horizontal joint. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage and was collapsed onto the lower span. It was laterally aligned and longitudinally shifted approximately one (1) to two (2) feet south over the lower cap.

The LOWER CAP sustained vertical cracks and minor spalls at the column connection. There was evidence of diagonal cracking throughout its length.

West side

The UPPER COLUMN severed at the base and collapsed, but remained attached to the upper cap. There was moderate fracture to the upper east side of the column, where it contacted the lower column and deck. This contact exposed the approximate top 1/3 of the column's vertical reinforcement. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. The base separated at the horizontal pinned connection joint, and the vertical dowels, and fractured keyway concrete, remained attached. The base of the column was moderately spalled from the joint up approximately 18 inches, on the west face.

The LOWER COLUMN was intact, but sustained fractures to the top. The west mat of vertical reinforcement was pulled out and bent down approximately 2/3 of the way down the column face.

The UPPER CAP sustained light to moderate damage, and was collapsed onto the lower span. It was laterally aligned and longitudinally shifted approximately one (1) foot south over the lower cap.

The LOWER CAP sustained vertical cracks and minor spalls at the column connection, and showed evidence of diagonal cracking throughout its length.

Span 100

East side

The UPPER SPAN collapsed and sustained light to moderate damage. It remained suspended over the lower span, and had a slight sag which started several feet from the bent caps. There was light to moderate diagonal cracking in the girder at the sag points. The span formed a slight hump over the bent cap. There was a moderate diagonal crack in the girder, and soffit fracture, at the bent. The girder was fractured at Bent 101 with the damage extending into the soffit. The span made a transition into a eastward shift as it approached Bent 101.

The LOWER SPAN was intact, but sustained light damage to the parapet rail.

West side

The UPPER SPAN collapsed onto the lower span, and had sustained moderate damage. The span formed a sag with the low points approximately 10 to 12 feet from the bent caps. There was extensive fracture and diagonal cracking in the girder along the sag areas, with damage extending into the top slab and soffit. The span was resting on the lower deck between the sag points, with the parapet railing intact. The span formed a slight hump over the bent cap. The girder was vertically fractured at the bent caps, with the damage extending into the top slab and soffit.

The LOWER SPAN was intact, but sustained light diagonal cracking in the exterior girder near the bent caps.

The UPPER SPAN ROADWAY surface formed a sag along the span, and a hump at the bent, which was slight in the #2 and #3 lanes and more severe in the #1 and #4 lanes.

Bent 101

East side

The UPPER COLUMN was severed at its base and collapsed, but remained attached to the upper cap. There was a portion of the fractured keyway, which contained the vertical dowels, below the horizontal joint at the column base. The exposed portions of the dowels had a slight northward bend. There was extensive fracture to the upper portion of the column at the cap attachment, which extended diagonally through the column to the east face midway down the its length. The vertical reinforcement was exposed, and had a slight eastward bend. The column core was missing in the fractured area. There was severe spalling to the lower west side at the base. There was minor spalling of the column base at the horizontal joint. The column was shifted south over the lower column.

The LOWER COLUMN was intact, and had extensive fracture to the top. The exterior mat of vertical reinforcement was pulled away from the east face approximately 1/3 of the way down from the top.

The UPPER CAP was collapsed on the lower span, approximately one (1) to two (2) feet east, and approximately two (2) to three (3) feet south, over the lower cap. It appeared to have sustained light to moderate damage.

The LOWER CAP sustained moderate cracking at the east column connection. The cracking increased in intensity towards the center, and there was a partial failure and deflection of the cap just east of the center.

West side

The UPPER COLUMN was severed at its base, and had collapsed. It remained attached to the upper cap. There was a portion of the fractured keyway, which contained the vertical dowels, below the horizontal joint at the column base. The exposed portions of the dowels had a slight northward bend. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was fractured concrete at the upper portion of the east face, where the column had contacted the lower column and deck.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel pulled out approximately 1/2 of the way down the west face.

The UPPER CAP sustained moderate damage and was collapsed onto the lower deck. It came to rest aligned east, and slightly south, over the lower cap.

The LOWER CAP sustained vertical cracking and minor spalls at the west column connection.

Span 101

East side

The UPPER SPAN sustained light to moderate damage, and was collapsed onto the lower span. The expansion hinge was shifted approximately (two) 2 feet south over the lower hinge, and had moderate damage, with fracture, to the support span hinge diaphragm. The support span was broken at the bent and angled down to the hinge. The support span had moderate cracking and fracture to the girder and soffit. The overhang span had less severe damage to the hinge diaphragm and sloped upward, from the hinge to Bent 102. There was light diagonal cracking in the exterior girder and a tear at the soffit, extending from the approximate 3/4 point to Bent 102. The span had begun an eastward shift, which increased towards Bent 102 where it was over the lower parapet. There was minor contact damage to the bottom of the exterior girder and soffit of the overhang span, on the south end, which was caused by the hand rail support assemblies.

The LOWER SPAN was intact, and had sustained light damage. There was diagonal cracking in the exterior girder of the support span, and minor cracking at the hinge diaphragm. There was minor damage to the parapet railing.

West side

The UPPER SPAN collapsed onto the lower span, and had sustained moderate damage. The deck had a slight hump over the bent cap. The span formed a sag with the low points at the expansion hinge, and at approximately eight (8) to 12 feet from Bent 102. The span was resting on the lower deck between the sag points. The girder was vertically fractured at the bent caps, with the damage extending into the top slab and soffit. There was a slight separation and vertical offset in the hinge, which was shifted approximately one (1) foot south over the lower hinge.

The LOWER SPAN was intact with light to moderate damage. There was fracture to the support span hinge bearing seat, which resulted in a slight deflection of the hinge. The overhang dropped slightly, and had diagonal cracking and spalling that extended back into the support span from the bearing seat. There was light diagonal cracking in the exterior girder near the bent caps.

The UPPER SPAN ROADWAY surface had sustained moderate damage. The collapse of the hinge, and fracture of the support span, created a steep ramp, up towards the bent, that would have severely hampered the passage of traffic in all lanes. The hinge had an approximate five (5) to seven (7) inch horizontal separation on the west side that closed up towards the east. There was also an approximate six (6) to 12 inch vertical offset on the west side, which decreased towards the #3 lane.

Bent 102

East side

The UPPER COLUMN severed at the top and base, and had collapsed. It came to rest in an upright position, with the base on the ground, and the top leaning against the lower column. The approximate top 1/3 of the column was completely destroyed, with only the upper east face attached to the exterior vertical reinforcement. The west mat of vertical reinforcement was exposed and bent down, forming a westward sag midway down the column. The remainder of the exposed reinforcement had a slightly east bend. The top part of the column was fractured, with a portion remaining attached to the upper cap steel which extended into the column. The bottom was separated at the horizontal pinned connection joint, and there was minor spalling to the column faces above the joint.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage, and had collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet east, and approximately one (1) to two (2) feet south, over the lower cap.

There was no data recorded for the LOWER CAP at the east side.

West side

The UPPER COLUMN severed at its base, and had collapsed, but remained attached to the upper cap. The top fractured at the cap connection, with a portion separating and remaining attached to the cap reinforcement. There was fracture to the east side of the column. The west mat of vertical reinforcement separated and remained attached to the upper cap. The base of the column severed at the horizontal joint, and the vertical dowels and fractured portions of the keyway concrete were attached and visible. The dowels were mostly clean and clear of concrete, and were bent north and eastward. There was minor spalling to the column base above the joint.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/3 of the way down the west face.

The UPPER CAP sustained moderate damage, and had collapsed onto the lower deck. It came to rest east, and slightly north, over the lower cap.

The LOWER CAP sustained moderate cracking and spalls on the west side at the column, and had diagonal cracks that extended towards the center of the cap.

Span 102

East side

The UPPER SPAN sustained moderate damage near the bent, and had collapsed onto the lower span. The span remained suspended over the lower deck, between the Bent 102 and 103. The eastward offset, between the upper and lower spans, increased towards Bent 103. There was a slight sag north of the bent, with severe diagonal cracking and fracture in the exterior girder that extended into the soffit. There were light diagonal cracks in the girder near Bent 103.

The LOWER SPAN was intact, and had no apparent damage.

West side

The UPPER SPAN sustained light to moderate damage, and had collapsed onto the lower span. There was a sag in the deck line, which started at approximately the 1/4 and 3/4 points along the length of the span. The sag was more pronounced at the south end of the span. The central portion of the span appeared to have settled onto the lower deck. There was diagonal cracking and fracture in the exterior girder at the sag points. The deck formed a hump as it crossed Bent 102.

The LOWER SPAN was intact, and had no apparent damage

The UPPER SPAN ROADWAY surface had sustained light damage. There was a hump over Bent 102, which would have hindered the passage of traffic in the #4 lane. This hump decreased towards the east side of the span.

Bent 103

East side

The UPPER COLUMN was severed at the base and collapsed, but remained attached to the upper cap. A portion of the west side of the column, directly below the cap connection, fractured away and fell to the ground. The west mat of vertical reinforcement was pulled away from the column face, and remained attached to the section that fell to the ground. There were portions of north and south mat of vertical reinforcement exposed to approximately 2/3 of the way down from the column top. The base failure occurred below the horizontal pinned connection joint. The vertical dowels and fractured keyway concrete were attached to the intact column base. The exposed ends of the dowels were bent to the west and north. There was spalling to the base, directly above the horizontal joint. The top portion of the column was fractured and rotated away from the cap face but remained attached by the embedded cap steel.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage, and had collapsed onto the lower span. It came to rest approximately three (3) to four (4) feet east, and slightly south, over the lower cap.

The LOWER CAP appeared to have been lightly damaged.

West side

The UPPER COLUMN was severed at its base and collapsed, but remained attached to the upper cap. There was a portion of the fractured keyway, which contained the vertical dowels, attached to the column base. The base appeared to have separated at the horizontal pinned connection joint. The exposed portions of the dowels had an eastward and southward bend. The top portion of the column was fractured and rotated away from the cap face, but remained attached by the embedded cap steel. There was fractured concrete, at the upper portion of the east face, that had contacted the lower column and deck.

The LOWER COLUMN was intact, but sustained light damage to the top, where it was contacted by the upper column.

The UPPER CAP sustained light to moderate damage and was collapsed onto the lower deck. It came to rest aligned eastward, and approximately one (1) foot north, over the lower cap.

The LOWER CAP appeared to have been lightly damaged. There was minor cracking and spalls on the west side at the column connection.

Span 103

East side

The UPPER SPAN sustained light damage, and had collapsed onto the lower span. It was suspended over the lower deck between the bent caps. There were light to moderate diagonal cracks in the exterior girder and fracture, at the soffit, near the bent caps. The eastward offset, between the upper and lower spans, continued to increase towards Bent 104.

The LOWER SPAN was intact with minor diagonal cracking in the exterior girder, near the bent caps.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. The span formed a sag between bents. There was extensive damage at Bent 103, where the girder separated from the top slab and collapsed, leaving an angular sag to the approximate 1/4 point along the span. The sag made a gentle rise back up from the approximate 3/4 point to Bent 104.

The LOWER SPAN sustained major damage, and had partially collapsed at Bent 104. The soffit was torn from the girder at Bent 104, and was deflected down approximately 6 feet. It angled up as it approached Bent 103, connecting to the girder at midspan. There was light to moderate diagonal cracking in the girder, from midspan northward. The girder was severely fractured at the cap connection at Bent 104, and was deflected down approximately one (1) to two (2) feet. The deck formed a sag between the bents, with moderate diagonal cracking near Bent 103, that extended up and northward into the top slab approximately 15 feet north of the bent.

The UPPER SPAN ROADWAY surface was intact, but sustained minor damage in the #1 and #2 lanes. There was a partial collapse of the roadway, in the #3 and #4 lanes, that created a sag which increased in severity towards the west. There was a sharp rise in the #4 lane over the bent cap.

Bent 104

East side

The UPPER COLUMN separated at the base and collapsed. The column was essentially destroyed, from below the bent cap to approximately three (3) to four (4) feet above the pinned connection joint. All the vertical reinforcement was exposed, and the concrete missing, with the exception of a thin layer of concrete that remained attached to the east mat of steel. The fracture ended in roughly a horizontal plane, level with the bottom of the upper cap. The west mat of vertical reinforcement was bent west and flat against the bottom of the cap, and appeared to extend underneath the collapsed cap. The remaining vertical steel was bent eastward and slightly northward, from top to bottom.

The LOWER COLUMN was intact, but sustained moderate fractures and spalling to the top.

The UPPER CAP sustained light damage and was collapsed onto the lower deck. It came to rest approximately five (5) to six (6) feet east, and slightly south, over the lower cap. There was fracture and major spalling at the column connection.

The LOWER CAP sustained moderate to major fracture and cracking throughout its length with moderate to major damage to the east column connection. The cap failed at its column connection on the west. The cap failure angled up sharply towards the east, and was hinged about the east column connection.

West side

The UPPER COLUMN separated at the top and base, and had collapsed. It was not available for inspection.

The LOWER COLUMN was intact, but sustained extensive damage to the top. The exterior mat of vertical reinforcement was pulled away from the west face, approximately 1/2 of the way down from the top. This steel had a marked northward bend.

The UPPER CAP sustained major damage and was collapsed onto the lower deck. It came to rest aligned east, and slightly north, over the lower cap.

The LOWER CAP sustained major damage, and had partially failed on the west side. The cap deflected down approximately four (4) to five (5) feet, exposing, and bending, the reinforcing steel, and tearing away from the exterior girders.

Span 104

East side

The UPPER SPAN sustained major damage, and had separated at the hinge. The overhang span had collapsed onto the lower deck. The support span remained attached to the bent, and sustained extensive damage to the hinge bearing seat and diaphragm. There was extensive fracture to the soffit in the general area of the eastern hinge restrainer assembly. The restrainer fractured and pulled through the support diaphragm. The overhang span had a sag at midspan, and had light to moderate diagonal cracking throughout the length of the girder. The span continued to overlap the lower span laterally, eastward, approximately five (5) to six (6) feet.

The LOWER SPAN sustained major damage, and had separated at the hinge. The overhang span had collapsed onto the ground. The support span was broken at Bent 104 and bent sharply downward. There was fracture and major spalling to the exterior girder, and the support span reinforcing steel was exposed and deformed. The support span hinge was completely destroyed.

The overhang span had a sag at midspan, and rose off of the ground towards Bent 105. There was diagonal cracking throughout the length of the exterior girder, with fracture and severe cracking near Bent 105.

West side

The UPPER SPAN sustained major damage, and was separated at the hinge. The overhang span had collapsed onto the lower deck. The support span was destroyed, and was hanging down in an arch from the upper cap. The overhang span was extensively fractured, and rose up slightly at Bent 105. The upper deck overhang hinge appeared to be shifted southward over the lower deck overhang hinge.

The LOWER SPAN was totally destroyed, and had collapsed onto the ground. The support span was destroyed, and was hanging down at a steep angle from the lower cap. The overhang span had failed at the hinge, and at Bent 105, and had extensive fracture along its length. The deck curved upward from the hinge towards Bent 105. The exterior girder was destroyed, remained on the ground, and was torn away from the top slab from the approximate 3/4 point to Bent 105.

The UPPER ROADWAY SURFACE was impassable to traffic in all lanes due to the failure at the hinge. The damage to the support span was more extensive on the west side, where the #4 lane and part of the #3 lane were shattered. The hinge restrainer assemblies pulled through the bottom of the support span diaphragm, fracturing the soffit. The support span bearing seat was intact along the center of the hinge. The lower support span roadway, and hinge, was destroyed, from midspan to the west edge, and was extensively damaged on the east side. The hinge diaphragm was moderately damaged along the east-central portion of the support span.

Bent 105

East side

The UPPER COLUMN was severed at the base and fractured at the top, and had collapsed onto the ground. The approximate top 1/3 of the column was fractured away and missing. The exposed vertical reinforcement was intertwined with the reinforcement from the upper cap. The column was separated, at the horizontal pinned connection joint, at the base. There was spalling to the exterior edges of the column above the joint. The top portion of the east mat of vertical reinforcement remained partially encased in a thin section of concrete, and was bent slightly eastward. The column was tilted to the north.

The LOWER COLUMN was destroyed, and the fractured remains were pushed southward. The exposed vertical reinforcement was generally bent down and southward in an inverted "U".

The UPPER CAP sustained light to moderate damage, and appeared to be shifted in excess of four (4) feet east, and slightly north, of the lower cap. It was collapsed onto the lower span, which was collapsed onto the ground.

The LOWER CAP was separated from the column, and had collapsed onto the ground. There was moderate diagonal cracking on the east side, several feet from the column.

West side

The UPPER COLUMN was severed at the top and base, and had collapsed. It was not available for inspection.

The LOWER COLUMN remained in place, and sustained extensive damage to the approximate top 1/2. The exterior mat of vertical reinforcement was pulled approximately 1/4 of the way down the west face. The interior mat of vertical reinforcement was pulled approximately 1/2 of the way down, and away from, the fractured east side. The east mat of steel was bent over to the east, in an inverted "U".

The UPPER CAP was extensively damaged, and had collapsed onto the lower span, which was collapsed onto the ground. The cap appeared to be shifted slightly south over the lower cap.

The LOWER CAP was separated from the column and had collapsed onto the ground. It appeared to have translated slightly northward. There was fracture on the northwest side of the cap, where it contacted two metal posts which were under the structure.

Span 105

East side

The UPPER SPAN sustained light to moderate damage, and had collapsed onto the lower span. There was a very slight hump in the deck as it crossed Bent 105. The span was suspended over the lower deck by the bent cap, and angled upward towards Bent 106. There was a sag in the span approximately 10 to 15 feet from Bent 106 that caused the soffit to contact the lower parapet rail. There was moderate fracture and diagonal cracking in the exterior girder at the sag point which extended into the soffit and top slab. The soffit was torn from the sag to Bent 106. There appeared to be a slight decrease in the east span offset, and a slight northward translation after contact with the lower rail.

The LOWER SPAN sustained moderate damage, and had collapsed onto the ground at the bent. The span angled upward across Bent 105, and towards Bent 106. There was a tear in the soffit at the exterior girder, which extended from the approximate 3/4 point to Bent 106.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower span, which was partially collapsed. There was an angular hump in the deck as it crossed Bent 105. There was a slight angular sag, approximately eight (8) to 10 feet from Bent 105. From this point the deck was straight as it angled up towards Bent 106. There was moderate diagonal cracking in the exterior girder throughout the span, which extended into the top slab at the approximate 1/3 points. The parapet railing was missing throughout the span.

The LOWER SPAN was essentially destroyed. It was collapsed onto the ground at Bent 105, and partially collapsed at Bent 106. The soffit was torn away from the exterior girder at Bents 105 and 106. It made a straight angle upward towards Bent 106, and was attached to the girder for approximately 10 to 12 feet near midspan. There was extensive cracking in the girder along the soffit fractures. The deck formed a sag at midspan, with fracture in the top slab at the approximate 1/3 points. There was an extensively fractured section of the exterior girder at the bent, which was torn away from the top slab. This section was approximately eight (8) to 10 feet in length.

The UPPER SPAN ROADWAY surface was lightly damaged. It was flat and angled upward towards Bent 106, with a slight sag in the #4 lane at Bent 105.

Bent 106

East side

The UPPER COLUMN severed at the top and base, and had collapsed. It was leaning against the side of the lower column. The approximate top 1/3 of the column was fractured from the west to east, and the vertical reinforcement was exposed. There was spalling at the base, directly above the horizontal pinned connection joint. The column appeared to have fractured at the upper cap connection, and separated at the horizontal joint at the base.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/2 of the way down the east face.

The UPPER CAP sustained light damage and was collapsed onto the lower span, approximately three (3) to four (4) feet eastward, and slightly north, over the lower cap. The cap was tilted south, which aligned with the slope of the span across Bent 106.

The LOWER CAP, on the east side, was fractured at the column and was tilted south to align with the slope of the span as it crossed Bent 106. It also appeared to have a slight vertical displacement.

West side

The UPPER COLUMN separated at the top and base, and had collapsed. It was leaning against the side of the lower column. There was extensive fracture to the approximate top 1/2 of the column, and only a small section of the west face attached to the exterior mat of vertical reinforcement. The remainder of the vertical reinforcement was uncontained and exposed in the damaged area. The bottom part appeared to have been separated at the horizontal pinned connection joint and was lightly damaged.

The **LOWER COLUMN** had extensive damage to the approximate top 1/3, with the vertical reinforcement uncontained and exposed. The exterior mat was bent out to the west. There was fracture at the cap connection.

The **UPPER CAP** sustained major damage and was collapsed onto the lower span, eastward, and approximately one (1) to two (2) feet south, over the partially collapsed lower cap.

The **LOWER CAP** had fractured and separated at the column on the west side, and had partially collapsed. A portion of the lower reinforcement was exposed and bent, indicating an approximate three (3) to four (4) foot vertical displacement of the west end.

Span 106

East side

The **UPPER SPAN** sustained light to moderate damage, was separated at the expansion hinge, and had collapsed onto the lower span. The support span had light damage to the top slab, was sloped upward towards the hinge, and was suspended over the lower deck. The parapet railing was missing from the support span. The support span hinge diaphragm was intact, and the east hinge restrainer assembly appeared to have severed at the cables and remained within the diaphragm. The hinge was separated approximately two (2) feet, with the support span above the overhang span, and appeared to be shifted north over the lower hinge. The overhang hinge diaphragm was intact, but sustained minor damage to the bearing seat. The overhang span was suspended over the lower deck and had a gradual upward slope. At the approximate 3/4 point of the span, there was a break in the deck line. The span was level to Bent 107. There was fracture in the top slab, and light diagonal cracking in the exterior girder at the approximate 3/4 point.

The **LOWER SPAN** sustained moderate damage, and had partially failed at the expansion hinge. The support span exterior girder separated from the hinge diaphragm and soffit. The span was sloped upward towards the hinge and aligned with the deck line from Span 105. The fractured soffit and hinge diaphragm angled down towards the hinge, which had a slight vertical deflection. The expansion hinge remained intact and closed. The overhang span was intact, and had no noticeable damage.

West side

The **UPPER SPAN** sustained moderate damage, and had collapsed onto the lower deck. There was extensive damage to the support span at the hinge. The parapet railing was missing on either side of the hinge. The span ramped up at Bents 106 and 107.

The **LOWER SPAN** sustained moderate damage, and had partially failed at Bent 106. The support span exterior girder separated from the hinge diaphragm and soffit. The span was sloped down towards the hinge, and the soffit was sloped upward and aligned with the soffit line from Span 105. The expansion hinge remained intact and closed, with minor damage to the overhang diaphragm. The overhang span had a slight upward slope, and there was fracture to the girder and soffit at the approximate 3/4 point, where the slope leveled to Bent 107.

The UPPER SPAN ROADWAY surface was offset at the expansion hinge. The overhang span fell below the level of the support span, creating an approximate two (2) to four (4) foot vertical offset at the hinge that would have prevented the passage of traffic. There was extensive damage to the support span hinge diaphragm on the west side, at the hinge restrainer assembly. The diaphragm fractured away from the support span, but remained attached to the overhang span, which caused major damage to the roadway surface in the #3 and #4 lanes. The roadway surface on the overhang span had moderate cracking in all lanes, which would not have affected travel.

Bent 107

East side

The UPPER COLUMN separated at the base, and had collapsed. It remained attached to the upper cap. There was fracture at the cap connection which extended down at an angle to the east face, just below the level of the bottom of the cap. The fracture extended from the north face to the south face, and exposed a portion of the vertical reinforcement. There was moderate to severe spalling to the east face, midway down the column. The base was separated at the horizontal pinned connection joint, with dowels and fractured keyway concrete attached. The dowels had a slight southward bend. There was light to moderate spalling to the column, above the horizontal joint at the base.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the east face.

The UPPER CAP sustained light damage, and was collapsed onto the lower deck approximately four (4) to five (5) feet east, and approximately one (1) to two (2) feet north, over the lower cap.

The LOWER CAP sustained light to moderate cracking on the east side at the column connection and light to moderate cracking towards the center.

West side

The UPPER COLUMN was severed at the base, and had collapsed, but remained attached to the upper cap. The column was fractured at the cap connection and was rotated away from the cap face, but remained attached by the embedded cap steel. The interior mat of vertical reinforcement was pulled away from the west face of the column, but remained attached to a portion of the fractured column top at the cap. The base was separated at the horizontal pinned connection joint, with dowels and fractured keyway concrete attached. The dowels had a slight northward bend. There was light spalling to the column above the horizontal joint at the base.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out, approximately 1/3 of the way down the west face.

The UPPER CAP sustained light to moderate damage and was collapsed onto the lower deck, several feet to the east, and slightly south, over the lower cap.

The LOWER CAP, on the west side, sustained light to moderate cracking, with a small portion of the bottom of the cap spalled away, exposing the reinforcing steel.

Span 107

East side

The UPPER SPAN sustained light to moderate damage, had collapsed onto the lower span, but remained suspended over the lower deck between Bents 107 and 108. There was smoke damage to the span, from Bent 107 to the approximate 2/3 point. The span was level across Bent 107 to the approximate 1/3 point where there was a break in the deck line which angled down slightly. There was a small fracture in the top slab, light to moderate diagonal cracking in the exterior girder, and an approximate eight (8) to 10 foot tear in the soffit at this sag point. The girder cracking continued northward towards Bent 108. There was another sag point approximately 10 to 12 feet south of Bent 108, where the deck made a moderately sharp rise to Bent 108. There was moderate to major fracture to the girder and top slab at this location, and a slight vertical offset in the girder, with the south side lower than the north. There was a tear in the soffit at the girder, which extended approximately 15 to 20 south from this sag point. The north side of the span angled up across Bent 108, and had no apparent damage. The eastward shift of the upper span appeared to decrease, with the exterior girder aligning on the inside of the lower parapet railing at Bent 108.

The LOWER SPAN was intact, but had sustained light damage. There were light diagonal cracks in the exterior girder and minor spalling at the soffit near Bent 108.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. The girder was torn away from the top slab and cap, and had collapsed onto the deck at Bent 107 The deck formed a hump over Bent 107, with the tear to the top slab extending approximately 10 to 12 feet northward. The deck formed a slight sag across midspan. There was extensive damage to the span, and a sharp angular rise in the deck approximately 10 to 12 feet south of Bent 108.

The LOWER SPAN was intact, but sustained minor diagonal cracking in the exterior girder near Bent 108.

The UPPER SPAN ROADWAY surface was intact and level in the #2 and #3 lanes. There was a slight rise at the bent caps in the #1 lane, and sharp rise at the bent caps in the #4 lane.

Bent 108

East side

The UPPER COLUMN was severed at the base, and had collapsed, but remained attached to the upper cap. The column was lightly damaged and was tilted to the south, aligned with the slope of the span across Bent 108. The column separated at the base, with the vertical dowels and fractured keyway concrete attached. The dowels appeared to be straight, and there was minor spalling to the base above the horizontal pinned connection joint.

The LOWER COLUMN sustained major damage, and had partially failed. There was extensive fracture through the column, which started at the west side, at the bottom of the lower cap, and extended, at an angle, to the east side at the ground. The vertical reinforcement was exposed in the damaged area, and was bent eastward and down. The column, on the east side of the fracture, was deflected slightly. There was crush fracture and spalling to the east face, at the ground. The top of the column was fractured, and the exterior mat of vertical reinforcement was pulled out approximately 1/2 of the way down the east face. This steel had a southward shift.

The UPPER CAP sustained light damage, and had collapsed onto the lower deck. It came to rest approximately three (3) to four (4) feet east, and approximately one (1) to two (2) feet north, over the lower cap. The cap remained attached to the upper column, and had no visible fracture at the connection.

The LOWER CAP sustained moderate diagonal cracking at the east side, which ran upward and westward from the bottom of the cap and into the soffit, near the column connection.

West side

The UPPER COLUMN separated at the top and base, and had collapsed. It came to rest in an upright position, with the base on the ground and the top leaning against the lower column. The interior mat of vertical reinforcement was fractured away from the east face of the column and was pulled eastward and under the bent cap. The top, east, portion of the column was fractured to the west face and was missing. The base of the column was severed at the horizontal pinned connection joint, with the vertical dowels and fractured keyway concrete attached.

The LOWER COLUMN was intact with fracture to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/2 of the way down the west face.

The UPPER CAP sustained moderate to major damage, and had collapsed onto the lower span. It came to rest eastward, and slightly north, over the lower cap. There was extensive fracture to the north and south girder connections, and to the bottom, where it contacted the lower deck.

The LOWER CAP had a severe crack approximately four (4) to five (5) feet east of the west column, with fracture and exposed reinforcement at the bottom. There was light cracking in the cap at the west side.

Span 108

East side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower span. The span remained suspended over the lower deck between the bent caps, and formed a curved sag with the low point at midspan. The span angled upward across Bent 108, to a point approximately three (3) to four (4) feet north of the cap where there was a break in the span. There was extensive fracture at this location that extended from the top slab through the exterior girder and into the soffit. This fracture angled southward from the top slab at approximately 45 degrees. There was a sharp break in the deck line as the girder to the north of the fracture deflected down approximately three (3) to four (4) inches, and slightly south, under the section attached to the cap. The soffit was torn away from the exterior girder northward from the fracture approximately 16 to 20 feet. There was light to moderate diagonal cracking in the girder along this section of the span. There was a less severe section of diagonal fracture in the exterior girder and soffit, approximately four (4) feet long, which was located approximately 10 to 12 feet south of Bent 109. There was light diagonal cracking in the girder from this area north to the bent. The span was offset east, with the exterior girder located just inside of the lower parapet railing.

The LOWER SPAN was intact with light diagonal cracking and soffit fracture near Bents 108 and 109. The line of the deck appeared straight between the bents. Portions of the parapet railing were apparently removed as part of rescue operations.

West side

The UPPER SPAN sustained light to moderate damage, and had collapsed onto the lower span, but remained suspended over the lower deck between Bents 108 and 109. There was extensive fracture in the exterior girder at the cap connection, which extended into the top slab and soffit. There was a tear in the soffit from the bent, north, approximately eight (8) to 10 feet. There was a sag in the span approximately 10 to 12 feet north of Bent 108, with diagonal cracking in the exterior girder and light fracture extending into the soffit. The span sloped upward, and had light to moderate diagonal cracking in the exterior girder from midspan to Bent 109. There was an area of moderate diagonal cracking in the girder, and approximately 10 to 12 foot soffit fracture located approximately 16 feet south of Bent 109.

The LOWER SPAN was intact, but sustained light damage to the parapet railing.

The UPPER SPAN ROADWAY surface had a sharp rise in the #1 and #4 lanes at Bent 108. The #2 and #3 lanes were flat across the span. The roadway sustained light damage across the span.

Bent 109

East side

The UPPER COLUMN separated below it's base, and had collapsed, but remained attached to the upper cap. The column was fractured at the cap and was rotated about the connection approximately 30 degrees, with the bottom translating north of the lower column. There was a minor spall to the northeast corner, midway down the column. The column severed below the horizontal pinned connection joint, and had an approximate two (2) to three (3) foot long diagonal section, that contained the vertical dowels, attached to the northeast corner. This section was below the horizontal joint, and extended partially along the east and north sides of the column. It was roughly angled from the northeast corner, upward toward the southwest corner, ending at the joint short of the corner.

The LOWER COLUMN sustained a diagonal fracture to the top, which extend down from the southwest corner to the northeast corner. The northern most bars in the east mat of vertical reinforcement remained attached to the fractured section on the upper column base, and were pulled out from the east face, midway down the column, and towards the north.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet east, and approximately one (1) to two (2) feet north, over the lower cap. The cap appeared to have a slight south twist, which would have aligned with the slope of the deck across Bent 109.

The LOWER CAP sustained extensive spalling at the east column connection. It appeared as if there was vertical cracking and a partial failure of the cap at this location. The cap appeared to be intact to the center column.

West side

The UPPER COLUMN sustained major damage, and was collapsed to the north of the lower column. The top of the column was pulled eastward, and crushed against the lower deck, with the vertical reinforcement remaining attached to the bottom of the cap. The column was completely fractured away, with several sections remaining attached to the vertical reinforcement, and hanging over the side of the lower span. The uncontained reinforcement was bent in many different directions.

The LOWER COLUMN was intact with light to moderate fracture to the top. The west mat of vertical reinforcement was pulled away from the top approximately four (4) to five (5) feet down from the top of the column and was bent slightly westward, southward, and down. The top west face of the column fractured away and remained attached to the mat of steel.

The UPPER CAP collapsed onto the lower deck and was shifted several feet to the east, and slightly north, over the lower cap. The cap appeared to be lightly damaged and slightly tilted to the south to align with the slope of the upper span across the bent.

There was no data gathered for the LOWER CAP at the west side, however, it was noted that the cap was braced between the columns.

Span 109

East side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. The support span was extensively damaged and curved downward and onto the lower deck, from Bent 109. The expansion hinge was shifted to the north over the lower hinge. The overhang span was level and rested on the lower deck. There was a slight rise in the deck line near Bent 110, and fracture in the exterior girder which extended upward and south from the cap into the top slab.

The LOWER SPAN sustained light damage to the support span. There was a tear in the soffit at the exterior girder from bent to the hinge, and light cracking at the support span hinge bearing seat.

West side

The UPPER SPAN sustained light damage, had collapsed onto the lower span, and remained suspended over the lower deck between Bents 109 and 110. The span was intact across Bent 109 and sloped upward towards the hinge, and was aligned with the upper deck slope from Span 108. The hinge had a slight separation above the bearing seat, with diagonal cracking to the lower portion of the support span hinge, and minor fracture to the support span bearing seat and overhang soffit. The overhang span had a slight downward slope from the hinge to Bent 110. There was light diagonal cracking in the exterior girder, and an approximate six (6) to eight (8) foot soffit tear at the girder base located approximately 10 to 15 feet south of Bent 110.

The LOWER SPAN sustained light damage. The bottom of the support span top slab overhang was fractured, from the bent to the hinge, as a result of contact with the base of the upper column. The longitudinal reinforcement at this location was pulled out and down. There was light diagonal cracking in the exterior girder near Bent 110.

The UPPER SPAN ROADWAY surface was offset at the expansion hinge. The overhang span roadway surface had minor pavement cracks and a slight downward slope towards the east. There was a failure in the span at the hinge, that resulted in a vertical offset between the overhang and support spans which would have prevented the passage of traffic in the #1 and #2 lanes. The offset was slight at the west edge of the span, and increased towards the east. It reached approximately 18 tc 24 inches at the east edge of the #3 lane. There was a collapse of the support span which started at the west side of the #3 lane and progressed eastward, and southward, to Bent 109, creating a steep ramp in both the #2 and #1 lanes. The pavement, and top slab concrete, was fractured and broken with the reinforcing steel exposed in the #1 and #2 lanes.

Bent 110

East side

The UPPER COLUMN separated at the top and base, and had collapsed. It came to rest south of the lower column. There was extensive fracture to the top half of the column at the cap connection, and evidence of spalling at the column base. The column was removed prior to this investigation.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/3 of the way down the east face.

The UPPER CAP sustained moderate damage, and had collapsed onto the lower span. It came to rest approximately two (2) to three (3) feet east, and approximately one (1) to two (2) feet north, over the lower cap. There was extensive damage to the bottom of the cap, where it contacted the lower deck, and at the column connection. There was extensive fracture that extended upward, and westward, from the lower east end of the cap to the top at the exterior girder. A fractured portion of the column top remained attached to the upper cap reinforcement.

The LOWER CAP sustained spalling and vertical cracks at the east column connection.

West side

The UPPER COLUMN separated at the base, and had collapsed. The base severed at the horizontal pinned connection joint, and the vertical dowels and fractured keyway concrete remained attached. There was no visible spalls at the column base. The top of the column was pulled eastward, and crushed against the lower deck, with the vertical reinforcement remaining attached to the bottom of the cap. The column sustained major damage. It was split longitudinally down the center, with the east half fractured and missing.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/2 of the way down the west face.

The UPPER CAP collapsed onto the lower deck, and was shifted several feet east, and slightly north, over the lower cap. The cap appeared to have light to moderate damage.

The LOWER CAP appeared as if there was light cracking at the west column connection. The cap appeared to be intact to the center column. No other data was obtained for damage, but it was noted that the cap was braced between the columns.

Span 110

East side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower deck. There was a hump in the upper deck as it crossed Bent 110, and the exterior was fractured and was pulled away from the cap and top slab. The span was resting on the lower deck, and the upper deck made a slight rise at Bent 111.

The LOWER SPAN was intact, but sustained light damage. There was an approximate three (3) to four (4) foot tear in the soffit, at the exterior girder, and light diagonal girder cracking at the bent cap.

West side

The UPPER SPAN sustained moderate damage, and had collapsed onto the lower span, but remained suspended over the lower deck between Bents 110 and 111. There were two areas of extensive span damage, located approximately six (6) to 10 feet from each bent. On the south end, the fracture extended from the soffit up and diagonally northward, through the top slab. The north side of the fractured span was deflected down, and slightly eastward and southward, under the south section. There was a joint in the parapet railing at this location with a marked lateral offset. The span had a slight rise northward to the second fracture point, where it sloped downward to Bent 111. On the north end, the soffit was separated laterally towards the center of the span, and had crush fracture extending through the exterior girder to directly below the top slab. The parapet over the fracture has a slight west offset.

The LOWER SPAN was intact and had no noticeable damage.

The UPPER SPAN ROADWAY surface had light damage, with fracture in the pavement, associated with the span fracture near Bent 110. There was a slight hump in the #1 and #2 lane at the cap. The #3 lane had a bump, with fractured pavement, that increased in severity, and extended into the top slab as it propagated into the #4 lane.

Bent 111

East side

The UPPER COLUMN separated at the base and collapsed. The column top had extensive fracture and was partially separated from the cap. The fracture extended approximately 1/3 of the way down the column length, and angled to the east face at mid-column. The vertical reinforcement of the column was exposed, and remained in contact with the cap.

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/3 of the way down the east face.

The UPPER CAP sustained moderate to major damage, and had collapsed onto the lower span. It came to rest approximately three (3) to four (4) feet east, and approximately one (1) to two (2) feet north, over the lower cap. There was a diagonal break in the cap extension which started at the lower east side, at the contact point with the lower parapet railing, and ran for approximately three (3) to four (4) feet to the top of the cap at the exterior girder.

There was no damage recorded for the LOWER CAP. It was noted that the cap was braced between the columns.

West side

The UPPER COLUMN sustained major damage, and had collapsed. The top of the column was pulled eastward, and was crushed between the cap and the lower deck. The vertical reinforcement remained attached to the bottom of the cap. The column was destroyed

The LOWER COLUMN was intact, but sustained fractures to the top. The exterior mat of vertical reinforcing steel was pulled out approximately 1/4 of the way down the west face.

The UPPER CAP collapsed onto the lower deck. It had shifted approximately three (3) to four (4) feet east, and approximately one (1) to two (2) feet south, over the lower cap. The cap sustained moderate damage where it contacted the lower parapet railing.

There was no damage recorded for the LOWER CAP. It was noted that the cap was braced between the columns.

Span 111

East side

The UPPER SPAN sustained light damage, and had collapsed onto the lower span, but remained suspended over the lower deck between Bents 111 and 112. There was a moderately fractured section of the exterior girder located approximately six (6) to eight (8) feet north of Bent 111. The fracture extended into the soffit and top slab.

The LOWER SPAN was intact, and had no noticeable damage.

West side

The UPPER SPAN sustained light damage, and had collapsed onto the lower span, but remained suspended over the lower deck between Bents 111 and 112. The span was intact over Bent 111, but sustained fracture to the parapet railing, at a vertical joint between two sections at the cap. There was light diagonal cracking in the exterior girder at Bent 111, which increased in severity to the north. There was moderate fracture to the soffit, with moderate diagonal girder cracks extending northward for approximately eight (8) to 10 feet. These fractures were located approximately 10 feet north of Bent 111. There was light cracking in the girder for the remainder of the span, and severe spalling to the girder face at Bent 112.

The LOWER SPAN was intact, and had no noticeable damage.

The UPPER SPAN ROADWAY surface was intact in all lanes, and had no obstructions to traffic. There was minor cracking in the pavement.

Bent 112

East side

The UPPER COLUMN remained standing, but was fractured horizontally, below the cap connection. There was extensive fracture to the approximate upper three (3) to four (4) feet of the column top which exposed the vertical reinforcement. The east mat of vertical reinforcement was pulled away from the cap, but remained attached to the column, and was bent westward. The remainder of the vertical column reinforcement remained embedded in the cap, and was bent westward and down. The column was apparently removed during rescue operations, and was not available for inspection.

There was no LOWER COLUMN at this location.

The UPPER CAP was broken and split apart. The fracture extended up, and westward, from the column connection to the exterior girder. The top portion of the cap, which remained attached to the column reinforcement, was shifted westward over the top of the upper deck. It had broken away the parapet railing, shifting it westward. The east side of the cap was apparently removed during rescue operations, and was not available for inspection. The cap shift was not determined.

There was no data recorded for the LOWER SPAN ABUTMENT.

West side

The UPPER COLUMN fractured at the top, separated at the cap connection, and fell over to the west. Portions of the vertical reinforcement remained attached to the cap, and was pulled away from the column faces. The exposed upper west face reinforcement had a southward bend.

There was no LOWER COLUMN at this location.

The UPPER CAP sustained light to moderate damage, and had collapsed onto the lower span. It came to rest slightly south over the lower abutment. A portion of the fractured column top remained attached to the cap, and had overlapped the lower parapet railing on the west. The cap appeared to be laterally aligned over the abutment.

There was no data recorded for the LOWER SPAN ABUTMENT.

Span 112

East side

The UPPER SPAN sustained major damage, and had collapsed onto the lower roadway. The overhang span separated from the support span at the hinge and collapsed, breaking approximately 10 to 15 feet south of Bent 113. The north side of the broken span remained in place and attached to Bent 113. The span was apparently removed as part of rescue operations, and was not available for inspection.

The LOWER ROADWAY was not a suspended span. It was in place, and had contact damage from the collapsed upper span.

West side

The UPPER SPAN sustained major damage, and had collapsed onto the lower roadway. There was extensive damage to the support span, which was fractured at the bent, and was angled downward toward the hinge. The exterior girder, top slab, and hinge diaphragm were essentially destroyed. There was severe spalling to the exterior girder, and extensive fracture to the top slab, directly above the bent cap. The overhang span separated from the support span at the hinge and collapsed, breaking approximately 10 to 15 feet south of Bent 113. The north side of the broken span remained in place and attached to Bent 113. The span was apparently removed as part of rescue operations, and was not available for inspection.

The UPPER SPAN ROADWAY surface was impassable in all lanes, due to the failure of the span south of Bent 113. The span was broken approximately 10 to 15 feet south of Bent 113. The break was irregular, with the soffit fractured closer to the bent than the upper slab and girders. The south side of the span separated at the expansion hinge, and fell onto the lower roadway. It was apparently removed during rescue operations, and was not available for inspection. From video tapes taken prior to the removal operation, it was determined that there was an approximate six (6) to eight (8) feet of separation at the hinge. There was extensive damage to the west side of the overhang and support spans. The central and east sides of the support and overhang bearing seats were intact, with light damage. The east hinge restrainer assembly pulled through the overhang diaphragm with damage to the top of the support span diaphragm penetration ports. The central restrainer assembly cables severed, which fractured the lower portion of the overhang diaphragm, and damaged the top of the support span diaphragm penetration ports.

List of Figures

E-1 Typical Cross Section, Box Girder construction.

E-2 Profile View showing the typical location of hinged expansion joints.

E-3 Typical Expansion Hinge.

E-4 Typical Elevation View, Bents 60 to 62.

E-5 Typical Bent Section, (Bent 64 elevation view).

E-6 Bent 109, Elevation view.

E-7 Bent 111, Elevation view.

E-8 Bent/Abutment 112, Elevation view.

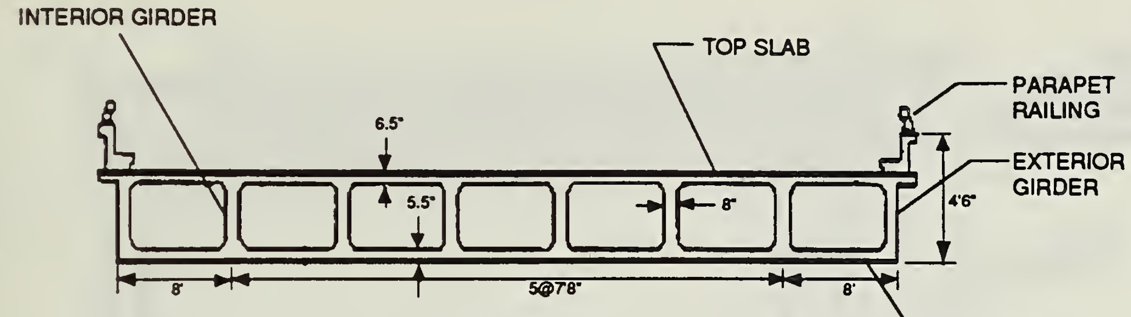


Figure E-1
TYPICAL CROSS SECTION, BOX GIRDER CONSTRUCTION

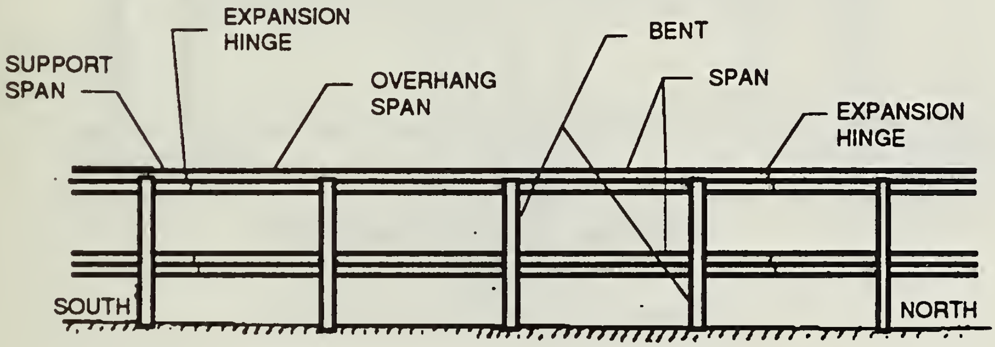


Figure E-2
PROFILE VIEW showing the typical location of expansion hinges

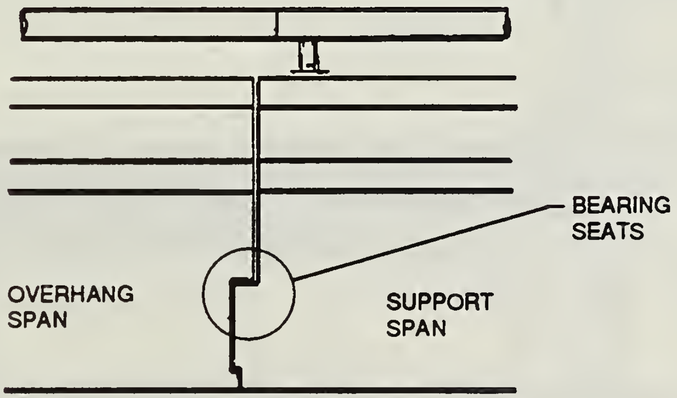


Figure E-3
TYPICAL EXPANSION HINGE

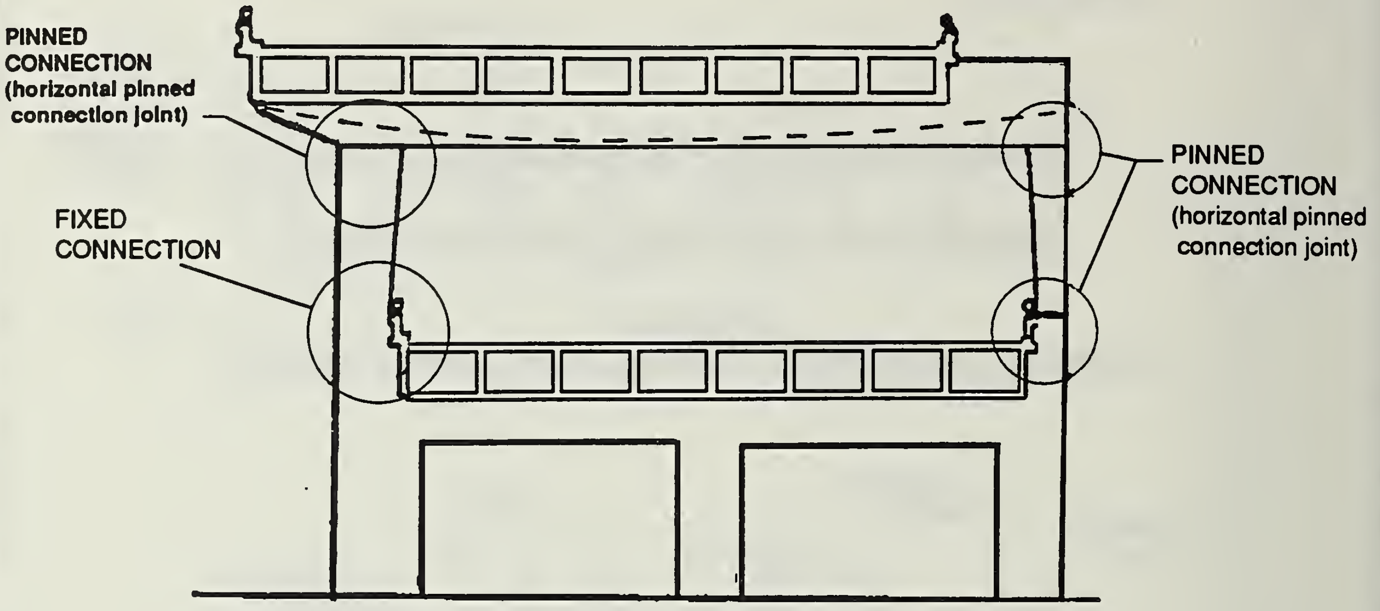

PINNED CONNECTION (horizontal pinned connection joint)
FIXED CONNECTION
PINNED CONNECTION (horizontal pinned connection joint)

Figure E-4
BENT 60, ELEVATION VIEW

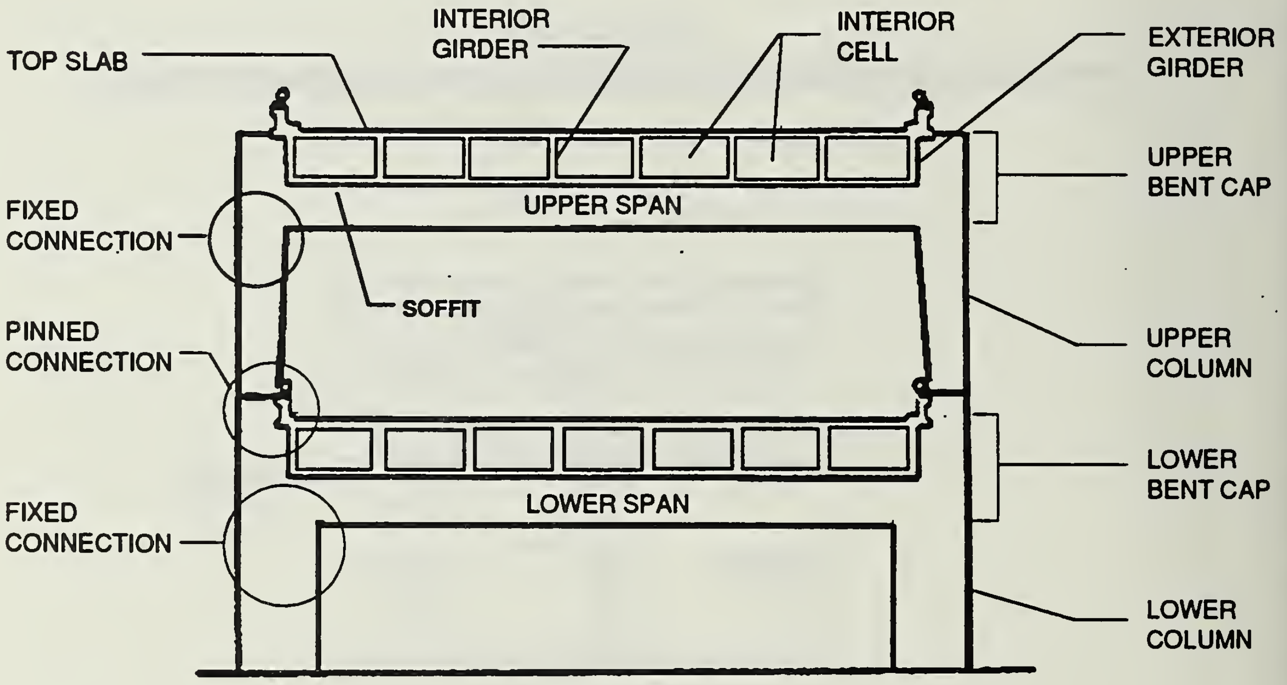


Figure E-5
TYPICAL BENT SECTION (Bent 64, elevation view)

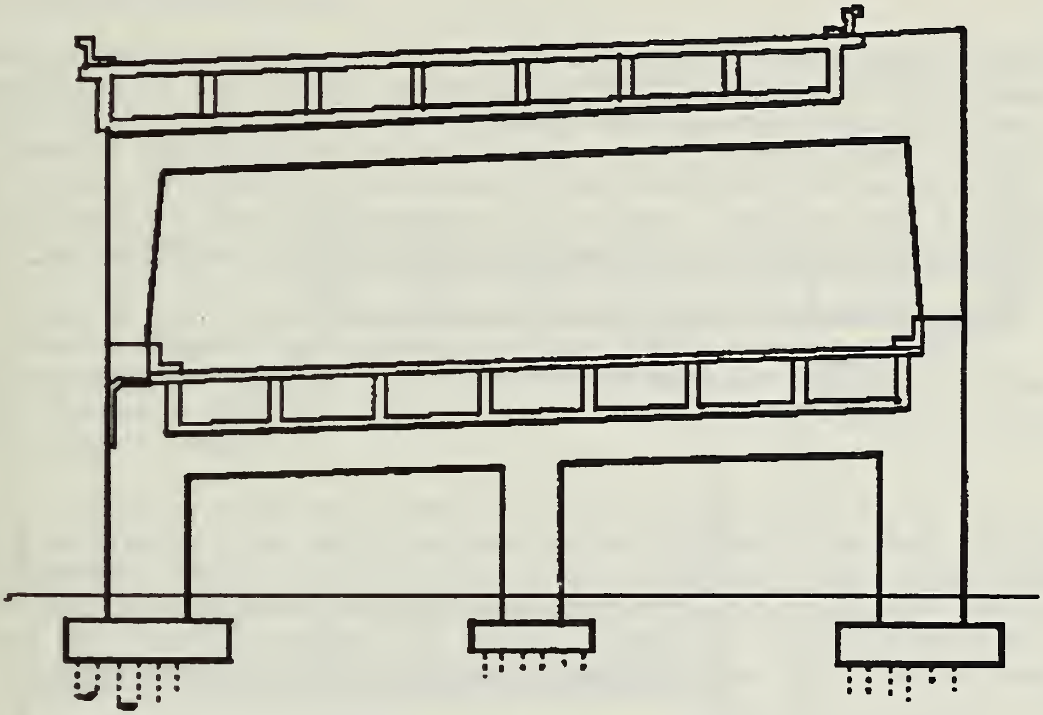


Figure E-6
BENT 109, ELEVATION VIEW

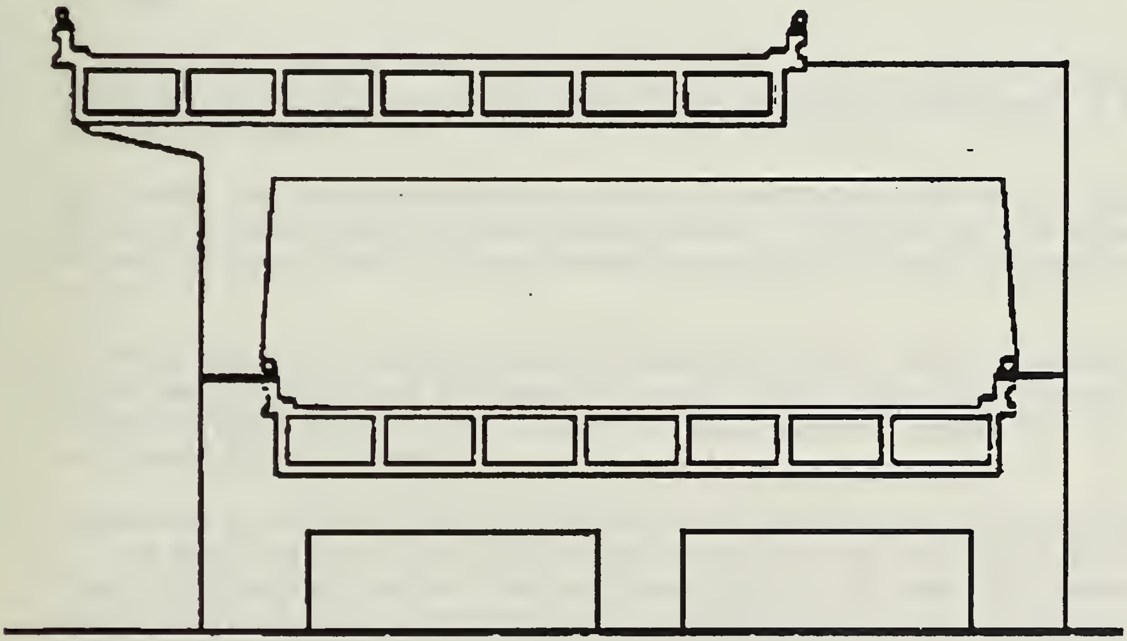


Figure E-7
BENT 111, ELEVATION VIEW

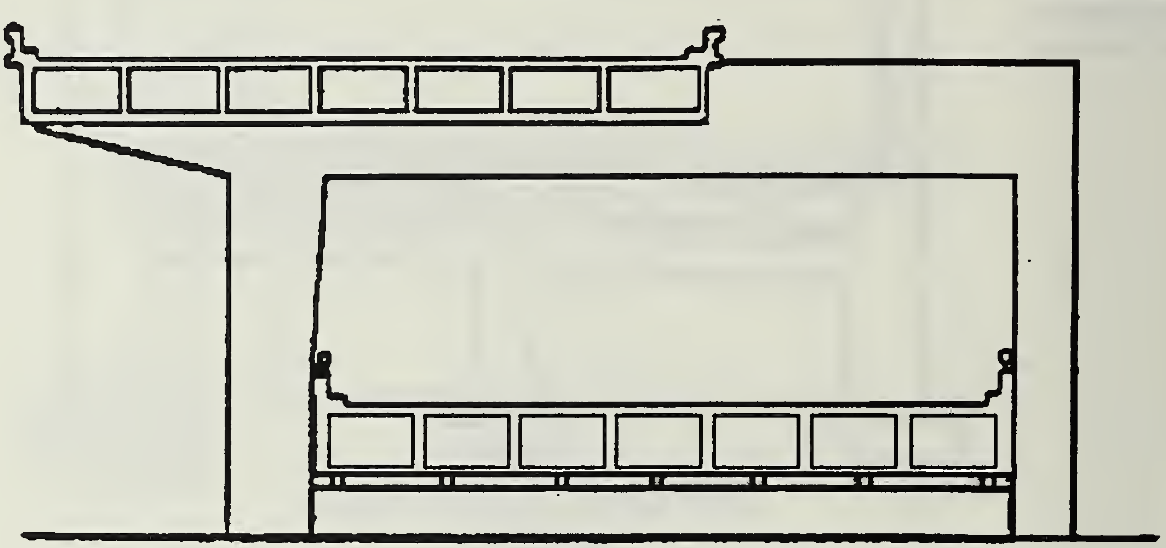


Figure E-8 BENT/ABUTMENT 112, ELEVATION VIEW

PHYSICAL EVIDENCE DESCRIPTION:

The following physical evidence description was prepared from aerial survey photographs taken of the Cypress Structure on October 18, 1989. Also used to reconstruct the location of physical evidence were photographs, and video footage, taken of the structure by individuals from the California Highway Patrol, Caltrans, Oakland P.D., various fire departments, the media, and private individuals. These photographs, and videos, represent the structure from just a few minutes, to several days, after the earthquake struck.

The item number in this description corresponds to the item number on the Physical Evidence Diagram depicted in set II of the Appendix to this investigation report. This Physical Evidence Diagram was completed by the Geometronics Branch of Caltrans, with the assistance of investigators from the California Highway Patrol.

The physical evidence description presented here represents the physical evidence reconstructed from the upper deck of the Cypress Structure, and from the surface streets immediately adjacent to the structure. Due to the nature of collapse of the structure, and the manner in which the upper deck spans were removed from the lower deck spans, it was not practical to reconstruct the physical evidence that may have been present on the lower deck roadway surface.

ITEM	DESCRIPTION
1.	There were scrape marks located in the southbound #4 lane approximately 12′ south of Bent 62. These marks began near the lane line separating the S-3 and S-4 lanes and extended to the southeast approximately six (6) feet.
2.	A scrape mark was located in the southbound #1 lane. This mark began approximately 35 feet north of Bent 75 and measured approximately two (2) feet in length.
3.	There were two scrape marks located in the southbound #2 lane. These marks were immediately adjacent to each other. They began approximately 35 feet south of Bent 77 and measured approximately four (4) feet in length.
4.	Concrete debris, as well as vehicle parts and fluid, were located in all of the northbound lanes of Cypress Street. This area of debris was located between Bents 74 and 76 and the east and west edges of northbound Cypress Street.
5.	There were a series of scrape marks which originated in the southbound #3 and #4 lanes approximately 50 feet south of Bent 80. These marks arced southeasterly across the southbound #3 and #2 lanes and ended under V-9 at its point of rest in the southbound #1 lane. These marks measured approximately 114 feet in overall length.

ITEM	DESCRIPTION
6.	There was a scuff mark located on the southbound #2 lane. The mark originated near the lane line between the S-2 and S-3 lanes approximately 25 feet north of Bent 79 and continued southeasterly approximately 11 feet.
7.	There were skid marks which originated in the southbound #2 lane at the expansion joint just north of Bent 80. These marks began as locked wheel skids and transitioned into broadside skids as they arced southeasterly into the southbound #1 lane. These marks were approximately 113 feet in overall length and ended in the southbound #1 lane approximately 19 feet south of Bent 79.
8.	There were a series of scrape marks located in the southbound #3 lane north of Bent 81. These marks began approximately one (1) foot south of Bent 81 and were approximately 15 feet in overall length.
9.	There were a series of scrape marks located in the southbound #1 lane north of Bent 82. These marks began approximately 39 feet north of Bent 82 and were approximately 14 feet in overall length.
10.	A vehicle bumper was located laying perpendicular to, and across, the southbound #1 and #2 lanes approximately 12 feet south of Bent 83.
11.	Scrape marks were located in the southbound #1 lane directly to the rear of V-13. These marks began approximately 39 feet south of Bent 84 and measured approximately eight (8) feet in overall length.
12.	A fluid trail was located in the southbound #2 and #3 lanes. It varied in width from 1 to 9 feet and was approximately 124 feet in length. The fluid trail began approximately two (2) feet north of Bent 85 and continued south to V-15's point of rest.
13.	Scrape marks were located in the southbound #2 and #3 lanes directly behind V-20 at it's point of rest. The scrapes measured approximately nine (9) feet in length and began approximately 17 feet north of Bent 86.
14.	A fluid trail was located in the southbound #1 lane. This fluid trail began approximately 51 feet north of Bent 87, ended under V-21 at its point of rest, and was approximately 121 feet in overall length.
15.	A series of scrape marks were located in the southbound #1 lane. These marks began approximately seven (7) feet north of Bent 88, were approximately parallel to the lane of travel, and were approximately 10 feet in overall length.
16.	A series of scrape marks were located in the southbound #4 lane north of Bent 88. These marks began approximately 27 feet north of Bent 88, were angled to the southwest, and were approximately three (3) feet in length.

ITEM	DESCRIPTION
17.	There were dual wheel tire scrub marks located in the southbound #2 lane south of Bent 89. These marks began at the right (west) edge of the southbound #2 lane approximately 31 feet south of Bent 89, continued southwesterly, and ended on the lane line between the southbound #2 and #3 lanes. These marks were approximately 20 feet in length.
18.	There were scrape marks located in the southbound #1 lane near its right (west) edge. These marks began approximately 39 feet south of Bent 89 and were approximately two (2) feet in length.
19.	There were scrape marks located in the southbound #1 lane at Bent 89. These marks began approximately one (1) foot north of Bent 89 and were approximately four (4) feet in length.
20.	An engine pool trail was found in the southbound #1 lane on the right side of V-24 at it's point of rest. The fluid pool continued south along the southbound #1 and #2 lane line. The fluid began approximately 38 feet north of Bent 89, and ended approximately 59 feet north of Bent 89.
21.	A series of scrape marks were located in the southbound #1 lane north of Bent 90. These marks began approximately 15 feet north of Bent 90, were approximately 25 feet in length, and ended just north of V-24.
22.	Scrape marks were found in the southbound #1 lane south of Bent 92. These marks began approximately 45 feet south of Bent 92 in the right (west) portion of the lane, and were approximately five (5) feet in length.
23.	A fluid trail was located in the southbound #3 and #4 lanes. This fluid trail began approximately one (1) foot north of Bent 92, near the midpoint of the southbound #3 lane, continued southwesterly into the southbound #4 lane, and ended under V-25 at its point of rest. The fluid trail was approximately 123 feet in overall length and varied from one (1) to three (3) feet in width.
24.	A fluid trail was located in the southbound #2 lane. This fluid trail began near the left (east) edge of the lane, approximately 23 feet south of Bent 94, and ended at the right (west) edge of the lane at the expansion joint north of Bent 92. This fluid trail was approximately 113 feet in overall length.
25.	Scrape marks were located in the southbound #3 lane, south of Bent 93, in the center of the lane. These marks began approximately 22 feet south of Bent 93 and were approximately two (2) feet in length.
26.	Scrape marks were located in the southbound #3 lane approximately 21 feet south of Bent 94. These marks were located in the right (west) half of the lane, and were approximately two (2) feet in length and four (4) feet in width.

ITEM	DESCRIPTION
27.	A scrape mark was found in the southbound #2 lane approximately 18 feet south of Bent 94. The scrape measured approximately two (2) feet in length and was approximately four (4) feet in width.
28.	Scrape marks were found in the southbound #2 lane, north of Bent 94, at the left (east) edge of the lane. These marks began approximately 40 feet north of Bent 94 and were approximately four (4) feet in length.
29.	Engine fluid was found in the southbound #2 lane on Cypress Street. The fluid spill was flowing toward the curb of the roadway and the center of the fluid was located approximately 69 feet north of 26th Street.
30.	Two scrape marks where found in the southbound #2 lane south of Bent 99. They each measured approximately four (4) feet in length. The first began approximately seven (7) feet south of Bent 99 and was located in the central portion of the lane. The second began approximately 25 feet south of Bent 99 and was located in the left (east) portion of the lane.
31.	A tire mark was located in the southbound #3 lane. The tire mark began in the central portion of the lane, approximately 19 feet north of Bent 100, veered southwesterly to the right (west) portion of the lane, then arced southeasterly to the left (east) portion of the lane, and ended at V-29's point of rest. This mark was approximately 66 feet in overall length.
32.	A scrape mark was located in the right (west) portion of the southbound #3 lane south of Bent 100. This mark began approximately ten (10) feet south of Bent 100 and was approximately three (3) feet in length.
33.	A series of scrape marks were located in the left (east) edge of the southbound #4 lane south of Bent 100. These marks began approximately four (4) feet south of Bent 100 and were approximately 24 feet in length.
34.	A broken section of metal bridge rail was found in the southbound #2 and #3 lanes. The section was approximately 12 feet in length and was located on Bent 100.
35.	A scrape mark was located in the central portion of the southbound #3 lane south of Bent 101. This mark began approximately 50 feet south of Bent 101 and was approximately four (4) feet in length.
36.	A series of scrape marks were found in the southbound #1 lane, beginning approximately 20 feet south of Bent 101, and ending approximately 70 feet south of Bent 101. The scrapes varied in length from 2 to 5 feet.
37.	A portion of broken information sign was found at the left edge of the southbound #4 lane. The sign was located in Span 100 approximately six (6) feet south of Bent 101.

ITEM	DESCRIPTION
38.	Scrape marks were found in the southbound #3 lane, at the expansion joint, approximately 10 feet north of Bent 101. The scrapes extend across the entire width of the southbound #3 lane and measure approximately three (3) feet in length.
39.	A series of scrapes were found in the southbound #1 lane. The northern most mark in the series was located at the right (west) portion of the lane. This mark began approximately 35 feet north of Bent 101 and was approximately four (4) feet in length. The next two marks were located in the left (east) portion of the lane. The first of these two marks began approximately 22 feet north of Bent 101 and was approximately four (4) feet in length. The second of these two marks began approximately 14 feet north of Bent 101 and ended 12 feet north of Bent 101.
40.	There was a scrape mark located in the central portion of the southbound #4 lane south of Bent 102. This mark began approximately 10 feet south of Bent 102 and was approximately 12 feet in length.
41.	A series of scrape marks were located in the central portion of the southbound #1 lane north of Bent 102. These marks began approximately 30 feet north of Bent 102 and measured approximately four (4) feet in length and four (4) feet in width.
42.	There were two distinct groups of scrape marks found in the southbound #3 and #4 lanes between Bents 103 and 104. The first group of scrape marks measured approximately three (3) feet to 18 feet in length and varied in width from a few inches to approximately three (3) feet. These scrape marks began in the southbound #3 lane, approximately 17 feet north of Bent 103, and continued south into the #4 lane. The second group of scrape marks were located in the left (east) portion of the southbound #3 lane and measured approximately five (5) feet and three (3) feet in length respectively. These scrape marks began approximately seven (7) feet north of Bent 103.
43.	A series of scrape marks were found in the right (west) half of the southbound #2 lane south of Bent 104. These marks began approximately 20 feet south of Bent 104 and were approximately three (3) feet in length.
44.	A tire mark and fluid trail were located between Bent 106 and V-38's point of rest. The tire mark and fluid trail began at the right (west) half of the southbound #2 lane approximately 47 feet north of Bent 105. The tire mark and fluid trail continued southwest across the southbound #3 lane, into the southbound #4 lane, and ended at V-38. The tire mark and fluid trail measured approximately 91 feet in length and varied from one (1) to three (3) feet in width.
45.	A scrape mark was located in the southbound #2 lane south of Bent 105. This mark began in the central portion of the lane approximately 26 feet south of Bent 105. The mark was angled from northeast to southwest and was approximately two (2) feet in length.

ITEM	DESCRIPTION
46.	There were two parallel scrape marks found in the southbound #3 lane north of Bent 105. These scrape marks began approximately 10 feet north of Bent 105, in the right half of the lane, and were approximately four (4) feet in length.
47.	There were two parallel scrape marks found in the southbound #3 lane north of Bent 105. These scrape marks began approximately 38 feet north of Bent 105, in the right half of the lane, and were approximately five (5) in length.
48.	A scrape mark was located in the central portion of the southbound #3 lane north of Bent 105. This scrape mark began approximately 45 feet north of Bent 105 and was approximately four (4) feet in length.
49.	Scrape marks were found adjacent to one another in the southbound #2 and #3 lanes in Span 107. The first scrape mark began in the southbound #2 lane, approximately 12 feet north of Bent 107, and was approximately five (5) feet in length and three (3) feet in width. The second scrape mark began in the southbound #3 lane approximately 10 feet north of Bent 107 and was approximately five (5) feet in length and three (3) feet in width.
50.	A tire scuff mark was located at the extreme left (east) edge of the southbound #2 lane, south of Bent 108, and was approximately five (5) feet in length.
51.	There were scrape marks found at the left (east) half of the southbound #2 lane north of Bent 108. These marks began approximately ten (10) feet north of Bent 108 and were approximately five (5) feet in length.
52.	A trail of engine fluid was found in the southbound #4 lane. This fluid trail began approximately 60 feet north of Bent 110 and continued in a southerly direction to V-42 at its point of rest. The fluid trail was approximately 196 feet in overall length.
53.	An engine fluid pool was found in the southbound #1 and partially in the southbound #2 lane. The fluid appeared to flow toward the south from V-43's point of rest, into the southbound #2 lane, then across the southbound #1 lane, and off the freeway. The fluid pool began at approximately Bent 109 and continued into Span 108. The overall length of the fluid pool was approximately 33 feet, and its overall width was approximately three (3) to 10 feet.
54.	There was a scrape mark located in the central portion of the southbound #4 lane north of Bent 109. This mark began approximately 27 feet north of Bent 109 and ended at Bent 109.
55.	There were dual wheel skid marks angling southeast in the southbound #1 lane south of Bent 110. These marks began approximately 25 feet south of Bent 110 and were approximately 15 feet in length.

ITEM	DESCRIPTION
56.	There were parallel tire marks located in the southbound #4 lane north of Bent 110. These marks began approximately 40 feet north of Bent 110 and were approximately 20 feet in length.
57.	There were parallel tire marks located in the southbound #4 lane just south of Bent 111. These marks began approximately seven (7) feet south of Bent 111, or 70 feet north of Bent 110, and were approximately two (2) feet in length.
58.	There was a scrape mark located at the right (west) half of the southbound #4 lane north of Bent 111. This mark began approximately 10 feet north of Bent 111 and was approximately two (2) feet in length.
59.	A scrape mark was located in the central portion of the southbound #1 lane north of Bent 111. This mark began approximately 19 feet north of Bent 111 and was approximately 12 feet in length.
60.	A scrape mark was located in the central portion of the southbound #2 lane south of Bent 112. This mark began approximately 31 feet south of Bent 112 and was approximately five (5) feet in length.
61.	A fluid trail was located in the left (east) half of the southbound #2 lane south of Bent 112. This fluid began approximately five (5) feet north of Bent 112 and was approximately 14 feet in length.
62.	There was a fluid pool and run off located along the right (west) edge of southbound #2 lane. This fluid pool and run off began at V-49's point of rest, continued westerly to a break in the roadway surface between the southbound #2 and #3 lanes, and then continued north to the expansion joint north of Bent 112.

As part of this investigation, literally thousands of photographs from the media, private individuals, and a myriad of public agencies were viewed, and evaluated, for their evidentiary content as it related to the objectives of this investigation. In total, copies of 562 photographs of evidentiary value were obtained from the following sources: Fremont F.D., Oakland F.D., San Ramon F.D., Oakland P.D., Caltrans, the Oakland Tribune, the San Francisco Chronicle, and from Jim Kassel of Herrington-Olson Photography in Oakland.

The negatives of these photographs, and their publication rights, remain with the agencies, businesses, or individuals that originally took the photographs. Consequently, these photographs are not available for purchase through the CHP and are not cataloged in this report.

Cataloged in this Photo Log are the 165 rolls of film taken by the CHP as part of its investigation and documentation of the collapse of the Cypress Structure. Copies of these photographs are available for purchase through the Oakland Office of the California Highway Patrol.

The date recorded for individual rolls of film is the approximate date(s) that the photographs were taken.

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
1	Academy	10/20/89	McFadden, B.	Photos of the structure showing the bracing and shoring to support the structure during demolition operations. Negatives maintained by CHP. (37 photographs)
2	Academy	10/20/89	McFadden, B.	Photos of the structure showing the shoring and bracing during the demolition operations, taken near 10th street. Negatives maintained by CHP. (39 photographs)
3	Academy	10/20/89	McFadden, B.	Photos showing the side view of the SFOBB, from both sides, long distance shots of YBI. Negatives maintained by CHP. (24 photographs)
4	Academy	10/20/89	McFadden, B.	Demolition of structure near 10th and 11th. Negatives maintained by CHP. (36 photographs)
5	Academy	10/20/89	McFadden, B.	Demolition of structure near 10th and 11th, and side view of the structure's west side, north of 11th. Negatives maintained by CHP. (35 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
6	Academy	10/20/89	McFadden, B.	Demolition of structure near 10th. Negatives maintained by CHP. (36 photographs)
7	Academy	10/20/89	McFadden, B.	Demolition of structure near 9th. Negatives maintained by CHP. (38 photographs)
8	Academy	10/20/89	McFadden, B.	Miscellaneous photographs of the Cypress Structure. Includes Bent 96, 104 and Distribution Structure. Negatives maintained by CHP. (21 photographs)
9	Academy	10/20/89	McFadden, B.	Aerial photos of Cypress Structure. Negatives maintained by CHP. (37 photographs)
10	Academy	10/20/89	McFadden, B.	Aerial photos of Cypress Structure. Negatives maintained by CHP. (25 photographs)
11	Academy	10/20/89	McFadden, B.	Aerial photos of Cypress Structure. Negatives maintained by CHP. (25 photographs)
12	Academy	10/23/89	McFadden, B.	Upper deck extrication photos, Command Post photos. Negatives maintained by CHP. (22 photographs)
13	Academy	10/23/89	McFadden, B.	Upper deck extrication photos showing body removal and body position of D-79. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (36 photographs)
14	Academy	10/23/89	McFadden, B.	Upper deck extrication site with Commissioner Hannagan, President's visit. Negatives maintained by CHP. (36 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
15	Academy	10/23/89	McFadden, B.	Upper deck photos, Valley MAIT personnel, President's visit. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (37 photographs)
16	Academy	10/23/89	McFadden, B.	Upper deck extrication sites, side views of the Cypress Structure. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (37 photographs)
17	Academy	10/23/89	McFadden, B.	Upper deck extrication sites, body position and point of rest of V-77. Negatives maintained by CHP. (36 photographs)
18	Academy	10/23/89	McFadden, B.	Upper deck photos, body extrication site, Commissioner's visit, Valley MAIT personnel, Caltrans. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (37 photographs)
19	Academy	10/23/89	McFadden, B.	Upper deck extrication sites, general damage. Negatives maintained by CHP. (36 photographs)
20	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage description on V-11. Negatives maintained by CHP. (8 photographs)
21	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions showing V-56, V-63, V-64 and V-71. Negatives maintained by CHP. (25 photographs)
22	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-66, V-88 and V-92. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
23	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-46 and V-49. Negatives maintained by CHP. (25 photographs)
24	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-90, V-94 and V-98. Negatives maintained by CHP. (22 photographs)
25	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-53, V-62 and V-79. Negatives maintained by CHP. (22 photographs)
26	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-86, V-92, V-101 and V-104. Negatives maintained by CHP. (24 photographs)
27	Golden Gate MAIT	11/07/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-67, V-87, V-89 and V-91. Negatives maintained by CHP. (24 photographs)
28	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage description of V-99. Negatives maintained by CHP. (22 photographs)
29	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage description of V-5. Negatives maintained by CHP. (13 photographs)
30	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage description of V-39. Negatives maintained by CHP. (10 photographs)
31	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-24 and V-34. Negatives maintained by CHP. (13 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
32	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-70 and V-105. Negatives maintained by CHP. (14 photographs)
33	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage description of V-40. Negatives maintained by CHP. (12 photographs)
34	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-76, V-99, V-100, and a vehicle, license number 1M91100 that was later determined not to be involved in the Cypress collaspe. Negatives maintained by CHP. (25 photographs)
35	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-84, V-97 and V-102. Negatives maintained by CHP. (18 photographs)
36	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-69, V-77 and V-81. Negatives maintained by CHP. (25 photographs)
37	Golden Gate MAIT	11/03/89	Linson, R. 9945	Post extrication photographs for damage description of V-5's semi-trailer. Negatives maintained by CHP. (13 photographs)
38	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-72, V-78, V-80 and V-83. Negatives maintained by CHP. (25 photographs)
39	Golden Gate MAIT	11/06/89	Linson, R. 9945	Post extrication photographs for damage descriptions of V-65, V-73 and V-95. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
40	Golden Gate MAIT	11/07/89	Kroger, C. 6100	Post extrication photographs for damage descriptions of V-7, V-20, V-93, V-96 and V-111. Negatives maintained by CHP. (19 photographs)
41	Golden Gate MAIT	11/07/89	Kroger, C. 6100	Post extrication photographs for damage descriptions of V-55, V-57, V-60 and V-75. Negatives maintained by CHP. (24 photographs)
42	Golden Gate MAIT	10/27/89	Romano, C.	Views of the Cypress Structure from the west side near Bents 67 to 70 and views of the upper deck. Negatives maintained by CHP. (25 photographs)
43	Golden Gate MAIT	10/27/89	Romano, C.	Views of the Cypress Structure taken from the east and west side of the structure from Bents 74 to 90. Negatives maintained by CHP. (25 photographs)
44	Golden Gate MAIT	10/27/89	Romano, C.	Views of the Cypress Structure from the under side of the lower deck and both sides from Bents 98 to 106. Negatives maintained by CHP. (13 photographs)
45	Golden Gate MAIT	10/27/89	Romano, C.	Views of the upper deck of the Cypress Structure taken near Bent 100. Negatives maintained by CHP. (13 photographs)
46	Golden Gate MAIT	11/06/89	McCarville, J. 10290	Post extrication photographs for damage description of V-41. Negatives maintained by CHP. (11 photographs)
47	Golden Gate MAIT	11/14/89	Kroeger	Post extrication photographs for damage description of V-37. Negatives maintained by CHP. (23 photographs)
48	Golden Gate MAIT	11/10/89	Franz 10735	Post extrication photographs for damage descriptions of V-13 and V-61. Negatives maintained by CHP. (21 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
49	Golden Gate MAIT	11/13/89	Franz P. 10735	Post extrication photographs for damage descriptions of V-34 and V-107. Negatives maintained by CHP. (20 photographs)
50	Golden Gate MAIT	11/18/89	J. Mengle	Post extrication photographs for damage description of V-21. Negatives maintained by CHP. (13 photographs)
51	Golden Gate MAIT	11/08/89	Franz, P. 10735	Post extriction photographs for damage descriptions of V-52, V-58 and V-59. Negatives maintained by CHP. (22 photographs)
52	Golden Gate MAIT	11/07/89	S. Mitchell	Post extrication photographs for damage descriptions of V-14 and V-33. Negatives maintained by CHP. (24 photographs)
53	Golden Gate MAIT	11/08/89	Franz, P. 10735	Post extrication photographs for damage descriptions of V-15, V-26 and V-36. Negatives maintained by CHP. (18 photographs)
54	Golden Gate MAIT	11/08/89	Kroger, C. 6100	Post extrication photographs for damage descriptions of V-4, V-31, V-47, V-82 and V-116. Negatives maintained by CHP. (23 photographs)
55	Golden Gate MAIT	11/08/89	R. Linson # 9945	Post extrication photographs for damage description of V-30. Negatives maintained by CHP. (17 photographs)
56	Golden Gate MAIT	11/10/89	Wong, P. 8736	Post extrication photographs for damage description of V-114. Negatives maintained by CHP. (12 photographs)
57	Golden Gate MAIT	11/01/89	Mengle, J. 7207	Post extrication photographs for damage description of V-50 and V-109. Negatives maintained by CHP. (13 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
58	Golden Gate MAIT	11/14/89	P. K. Franz # 10735	Vehicle, license number 2FHM749, parked unoccupied under Span 104. Negatives maintained by CHP. (12 photographs)
59	Golden Gate MAIT	11/14/89	C. Kroeger	Post extrication photographs for damage descriptions of V-29, V-54, V-74 and V-85. Negatives maintained by CHP. (23 photographs)
60	Golden Gate MAIT	11/15/89	C. Kroeger	Post extrication photographs for damage descriptions of V-6, V-44, V-45 and V-103. Negatives maintained by CHP. (24 photographs)
61	Golden Gate MAIT	11/15/89	P.K. Franz # 10735	Post extrication photographs for damage descriptions of V-19, V-23 and V-106. Negatives maintained by CHP. (16 photographs)
62	Golden Gate MAIT	11/07/89	P.K. Franz # 10735	Post extrication photographs for damage descriptions of V-1, V-38, V-42, V-64 and a vehicle, license number 2FHM749, that was parked unoccupied under the Cypress Structure. Negatives maintained by CHP. (25 photographs)
63	Golden Gate MAIT	11/14/89	P.K. Franz # 10735	Post extrication photographs for damage descriptions of V-8, V-28, V-50 and V-112. Negatives maintained by CHP. (24 photographs)
64	Golden Gate MAIT	11/19/89	R. Linson # 9945	Post extrication photographs for damage description of V-35. Negatives maintained by CHP. (8 photographs)
65	Golden Gate MAIT	11/19/89	R. Linson # 9945	Post extrication photographs for damage descriptions of V-27 and V-47. Negatives maintained by CHP. (19 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
66	Golden Gate MAIT	11/17/89	C. Kroeger # 6100	Post extrication photographs for damage descriptions of V-9, V-12, V-22, V-25 and V-41. Negatives maintained by CHP. (22 photographs)
67	Golden Gate MAIT	12/04/89	P.K.Franz # 10735	Post extrication photographs for damage description of V-43's trailer. Photographs of the Cypress Structure near Bent 45. Negatives maintained by CHP. (25 photographs)
68	Golden Gate MAIT	12/04/89	R. Linson # 9945	Post extrication photographs for damage description of V-43. Negatives maintained by CHP. (12 photographs)
69	Golden Gate MAIT	12/04/89	P.K. Franz # 10735	Post extrication photographs for damage description of V-110. Negatives maintained by CHP. (9 photographs)
70	Golden Gate MAIT	12/01/89	P.K. Franz # 10735	Post extrication photographs for damage description of V-66. Views of vehicle while being measured for damage profile. Negatives maintained by CHP. (20 photographs)
71	CHP ID Team	10/29/89	Hill, J. 8421 R47705	Point of rest and recovery of V-68 and V-85. Negatives maintained by CHP. (16 photographs)
72	CHP ID Team	10/29/89	Sleeper, T. 11064	Point of rest and recovery of V-87 and V-88. Negatives maintained by CHP. (24 photographs)
73	CHP ID Team	10/30/89	CHP	Point of rest and recovery of V-66. Negatives maintained by CHP. (13 photographs)
74	CHP ID Team	11/01/89	Celestre, R. 5478	Point of rest and recovery of V-98. Negatives maintained by CHP. (6 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
75	CHP ID Team	11/01/89	Sleeper 11064 / Celestre	Point of rest of V-100. Negatives maintained by CHP. (4 photographs)
76	CHP ID Team	11/01/89	Sleeper 11064 / Celestre	Point of rest and recovery of V-100. Negatives maintained by CHP. (6 photographs)
77	CHP ID Team	10/31/89	Bjorklund # 4760	Point of rest of V-105. Negatives maintained by CHP. (11 photographs)
78	CHP ID Team	10/30/89	Hoyle, K. 10712	Recovery of V-90. Negatives maintained by CHP. (12 photographs)
79	CHP ID Team	10/30/89	CHP	Point of rest of V-86. Negatives maintained by CHP. (9 photographs)
80	CHP ID Team	10/31/89	Bjorklund # 4760	Point of rest and recovery of V-99. Negatives maintained by CHP. (11 photographs)
81	CHP ID Team	10/30/89	Kowalewski, S. 7739	Point of rest and recovery of V-89 and V-91. Negatives maintained by CHP. (16 photographs)
82	CHP ID Team	10/31/89	Wolowic	Point of rest and recovery of V-101. Negatives maintained by CHP. Photographs out of focus and poor quality. (10 photographs)
83	CHP ID Team	10/30/89	Sleeper, T. 11064	Not Exposed
84	CHP ID Team	10/30/89	Sleeper, T. 11064	Point of rest and recovery of V-65. Negatives maintained by CHP. (10 photographs)
85	CHP ID Team	10/30/89	Levanitas, John	Recovery of V-92. Negatives maintained by CHP. (10 photographs)
86	CHP ID Team	10/30/89	Sleeper, T. 11064	Post extrication of V-49 and point of rest and recovery of V-64. Negatives maintained by CHP. (10 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
87	CHP ID Team	10/29/89	CHP	Point of rest and recovery of V-69. Negatives maintained by CHP. Photographs out of focus. (11 photographs)
88	CHP ID Team	11/01/89	Celestre, R. 5478	Point of rest and recovery of V-102. Negatives maintained by CHP. (10 photographs)
89	CHP ID Team	10/30/89	Kowalewski, S. 7739	Recovery and body removal of D-68. Negatives maintained by CHP. (17 photographs)
90	CHP ID Team	10/31/89	Hoyle, K. 10712	Point of rest and removal of V-86. Negatives maintained by CHP. (11 photographs)
91	CHP ID Team	10/31/89	Hoyle, K. 10712	Point of rest of V-86. Negatives maintained by CHP. (14 photographs)
92	CHP ID Team	10/29/89	Hoyle, K. 10712	Point of rest and recovery of V-67. Negatives maintained by CHP. (12 photographs)
93	CHP ID Team	10/29/89	Hoyle, K. 10712	Recovery of V-67. Negatives maintained by CHP. (11 photographs)
94	CHP ID Team	11/01/89	Bjorklund # 4760	Point of rest and recovery of V-103. Negatives maintained by CHP. (12 photographs)
95	CHP ID Team	10/31/89	Sleeper 11064 / Celestre	Point of rest and removal of V-63. Negatives maintained by CHP. (7 photographs)
96	CHP ID Team	10/31/89	Sleeper 11064 / Celestre	Point of rest of V-63. View of body position at point of rest. Negatives maintained by CHP. (4 photographs)
97	CHP ID Team	10/31/89	Bjorklund # 4760	Point of rest of V-104. Negatives maintained by CHP. (11 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
98	CHP ID Team	11/03/89	Nelson 10037	Point of rest of V-97. Negatives maintained by CHP. (11 photographs)
99	CHP ID Team	11/04/89	Nelson 10037	Point of rest of V-81. Negatives maintained by CHP. (13 photographs)
100	CHP ID Team	11/05/89	Celestre, R. 5478	Removal of V-79. Negatives maintained by CHP. (8 photographs)
101	CHP ID Team	11/05/89	Bjorklund # 4760	Point of rest and removal of V-80. Negatives maintained by CHP. (12 photographs)
102	CHP ID Team	11/05/89	Walker 9919	Recovery of V-83. Negatives maintained by CHP. (13 photographs)
103	CHP ID Team	11/06/89	Celestre, R. 5478	Point of rest and beginning of recovery of V-95. Negatives maintained by CHP. (11 photographs)
104	CHP ID Team	11/05/89	Celestre, R. 5478	Point of rest of V-77. Negatives maintained by CHP. (9 photographs)
105	CHP ID Team	11/05/89	Celestre, R. 5478	Point of rest and recovery of V-76. Negatives maintained by CHP. (9 photographs)
106	CHP ID Team	11/05/89	Celestre, R. 5478	Point of rest of V-84. Negatives maintained by CHP. (9 photographs)
107	CHP ID Team	11/05/89	Jorklund 4760 / Sleeper	Recovery of V-78. Negatives maintained by CHP. (9 photographs)
108	CHP ID Team	11/05/89	Jorklund 4760 / Sleeper	Point of rest and recovery of V-78. Negatives maintained by CHP. (5 photographs)
109	CHP ID Team	11/06/89	Celestre, R. 5478	Point of rest of V-96. Negatives maintained by CHP. (13 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
110	CHP ID Team	11/06/89	Kowalewski / Silva	Points of rest of V-73, V-74 and V-75. Negatives maintained by CHP. (21 photographs)
111	CHP ID Team	11/05/89	Celestre, R. 5478	Point of rest and recovery of V-82. Negatives maintained by CHP. (7 photographs)
112	CHP ID Team	11/07/89	Celestre, R. 5478	Recovery of V-59. Negatives maintained by CHP. (16 photographs)
113	CHP ID Team	11/07/89	Celestre, R. 5478	Point of rest of V-53. Negatives maintained by CHP. (10 photographs)
114	CHP ID Team	11/07/89	Nelson 10037	Point of rest and recovery of V-71. Negatives maintained by CHP. (15 photographs)
115	CHP ID Team	11/06/89	Celestre, R. 5478	Point of rest and recovery of V-93. Negatives maintained by CHP. (11 photographs)
116	CHP ID Team	11/06/89	Green, M. 12343	Recovery of V-56. Negatives maintained by CHP. (12 photographs)
117	CHP ID Team	11/06/89	Nelson 10037	Point of rest of V-56. Negatives maintained by CHP. (11 photographs)
118	CHP ID Team	11/06/89	Kowalewski, S. 7739	Points of rest and recovery of V-72 and V-73. Negatives maintained by CHP. (22 photographs)
119	CHP ID Team	11/07/89	Celestre, R. 5478	Point of rest and recovery of V-54. Negatives maintained by CHP. (16 photographs)
120	CHP ID Team	11/07/89	Nelson 10037	Recovery of V-61. Negatives maintained by CHP. (16 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
121	CHP ID Team	11/07/89	Nelson 10037	Point of rest and recovery of V-62. Negatives maintained by CHP. (12 photographs)
122	CHP ID Team	11/06/89	Celestre, R. 5478	Point of rest and recovery of V-94. Negatives maintained by CHP. (11 photographs)
123	CHP ID Team	11/07/89	Celestre, R. 5478	Points of rest of V-51 and V-52. Negatives maintained by CHP. (25 photographs)
124	CHP ID Team	11/07/89	Sleeper, T. 11064	Point of rest and recovery of V-55. Negatives maintained by CHP. (10 photographs)
125	CHP ID Team	11/07/89	Sleeper, T. 11064	Point of rest and recovery of V-54's trailer. Negatives maintained by CHP. (8 photographs)
126	CHP ID Team	11/07/89	Nelson 10037	Recovery of V-58. Negatives maintained by CHP. (24 photographs)
127	CHP ID Team	11/07/89	Nelson 10037	Recovery of V-57. Negatives maintained by CHP. (17 photographs)
128	CHP ID Team	11/07/89	Nelson 10037	Recovery of V-60. Negatives maintained by CHP. (16 photographs)
129	Oakland Area	10/23/89	Envelope 8109	Night time photo of Cypress Structure, side view. Negatives maintained by CHP. (1 photograph)
130	Oakland Area	10/23/89	Envelope 8110	Night time photos of Cypress Structure showing side view with crane in place and shows the access to the lower deck with ladder in place. Negatives maintained by CHP. (3 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
131	Oakland Area	10/24/89	Envelope 8123	Cypress EOC and extrication sites. View of V-72, V-103 and V-104. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (10 photographs)
132	Oakland Area	10/24/89	Envelope 8124	Night time photos of extrication sites, one showing body at POR, V-72 and V-105. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (5 photographs)
133	Oakland Area	10/18/89	Envelope 4769B	View of vehicles on upper deck between 34th and 32nd. View of V-50, V-60 and V-107. View of Bay Bridge and miscellaneous upper and lower deck. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (23 photographs)
134	Oakland Area	10/18/89	Chambers, V. 10711	Day time photos of Cypress Structure from W. Grand Ave., north to Distibution Structure. Shows removal of overturned truck from upper deck. Photos of V-30, V-32 and V-69. Negatives maintained by CHP. (23 photographs)
135	Oakland Area	10/18/89	Chambers, V. 10711	Day time photos of Toll Plaza and Bay Bridge, photos of Cypress Structure adjacent to 32nd St. One photograph of the group of vehicles clustered at Bent 109. Negatives maintained by CHP. (11 photographs)
136	Oakland Area	10/18/89	Chambers, V. 10711	Day time photos of Command Post, 7 photos of upper deck, 10 photos of the west side of the structure from Bents 70 to 96. Negatives maintained by CHP. (23 photographs)
137	Oakland Area	10/24/89	Wong, T.	View of both sides of the structure from Cypress St. and upper deck breaks in the roadbed S/O the Distribution Structure. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
138	Oakland Area	10/24/89	Wong, T.	General photos showing damage profile of Cypress Structure. Negatives maintained by CHP. (25 photographs)
139	Oakland Area	10/24/89	Wong, T.	Photos of Bay Bridge fatal vehicle at Toll Plaza, lower deck of Cypress, and V-101 at extrication site. Negatives maintained by CHP. (25 photographs)
140	Oakland Area	10/19/89	Kenard # 8117	Recovery photographs of V-99, V-103, V-104, and V-105. Negatives maintained by CHP. (26 photographs)
141	Oakland Area	10/19/89	Kenard # 8117	View of the Cypress Structure from the upper deck at night, showing some of the painted outlines of the vehicles points of rest on the lower deck. Shows painted outline of the point of rest of V-13 and V-15. Negatives maintained by CHP. (12 photographs)
142	Oakland Area	10/19/89	Kenard # 8117	View of the upper deck of the Cypress Structure during darkness. Extrication of V-72 and V-99. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (13 photographs)
143	Hayward Area	10/17/89	Jeff Tatro	View of the entire upper deck of the structure showing the POR's of most vehicles on the upper deck. View of the rescue attempts in progress, and the damage to the structure on the upper deck, and view of the damage taken from the side of the structure. Negatives maintained by CHP. (36 photographs)
144	Golden Gate Air Ops	10/17/89	Seaman, R. 5072	Aerial photos of the Cypress Structure taken approximatley twenty to thirty minutes after the earthquake. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
145	Oakland Area	10/18/89	Unknown	Photos showing miscellaneous views of the Cypress Structure, primarily of the east side, from 18th St. to the Distribution Structure. Photos of the extrication of V-50. Negatives maintained by CHP. (24 photographs)
146	Valley MAIT	10/20-22	Whiting, P.	Sideview of Cypress Structure, Bents 71 to 73. Upper deck photos showing extrication sites. General view looking south between 18th & 19th ave. Extrication photo's of V-99, V-103, and V-104. Negatives maintained by CHP. (24 photographs)
147	Valley MAIT	10/20-22	Whiting, P.	Miscellaneous lower deck photos. Photos of V-95 and V-96 at their POR. Paint marks on the upper deck indicating the location of V-13, V-17, V-19's trailer prior to removal, V-20, and V-86. Photos of V-10's POR and post extrication. Negatives maintained by CHP. (25 photographs)
148	Valley MAIT	10/20-22	Whiting, P.	Lower deck showing some body positions and body extrications. Several upper deck photos. Points of rest and extrication of V-68, V-70, V-72, V-73, V-74's trailer, and V-75. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (25 photographs)
149	Valley MAIT	10/20-22	Whiting, P.	Lower deck vehicles showing points of rest and occupant positions of V-63, V-64, V-65 and V-91. General view of the west side of the structure. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (12 photographs)
150	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 62 to 71, west side. View of the shoring of the under side of the structure. The damage of the support posts of the structure. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
151	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 71 to 83, west side. Shows the damage to the bents. Negatives maintained by CHP. (25 photographs)
152	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 83 to 97, west side. Shows the damage to the bents. Negatives maintained by CHP. (25 photographs)
153	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 97 to 108, west side. Shows the damage to the bents. Negatives maintained by CHP. (25 photographs)
154	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 108 to 112, east and west side. Shows the damage to the bents. Negatives maintained by CHP. (25 photographs)
155	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 99 to 108, east side. Shows the damage to the bents. Negatives maintained by CHP. (13 photographs)
156	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 87 to 99, east side. Shows the damage to the bent and the shoring under the structure. Negatives maintained by CHP. (25 photographs)
157	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 74 to 87, east side. Shows the damage to the bent and the shoring under the structure. Negatives maintained by CHP. (25 photographs)
158	Valley MAIT	10/21/89	Whiting, P.	Sideview Cypress Structure, Bents 62 to 73. Shows the damage to the bent and the shoring under the structure. Negatives maintained by CHP. (25 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
159	Valley MAIT	10/20-22	Whiting, P.	Upper Deck showing extrication sites and points of rest of V-69, V-70, V-72, V-73, V-76, V-77, V-79, V-89, V-91, V-92, V-99, V-100, V-101, V-103, V-104 and V-105. Negatives maintained CHP. (20 photographs)
160	Valley MAIT	10/20-22	Whiting, P.	Upper deck showing extrication sites of V-54, V-56, V-59 and V-60. Miscellaneous photos of structure damage and bent rebar. Negatives maintained by CHP. (12 photographs)
161	Valley MAIT	10/20-22	Lemison, R.	Upper deck showing extrication sites. Several photos of President's visit shot from upper deck. Extrication of V-79 and D-79. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (12 photographs)
162	Valley MAIT	10/20-22	Lemison, R.	Upper deck of structure showing damage, extrication sites, and body extrication. Shows the area of upper deck where vehicles crashed through the guardrail and landed on Cypress St. Photo of V-99 at POR. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (12 photographs)
163	Valley MAIT	10/20-22	Walker, S.	Extrication sites and POR for V-96, V-100, V-101, and V-105. Photos of the west side of the structure at W. Grand Ave. Negatives maintained by CHP. (20 photographs)
164	Valley MAIT	10/20-22	Walker, S.	Upper deck showing extrication sites, one body. Point of rest of V-77 and V-95. Views showing expansion joint at Bent 95. ***CONTAINS SENSITIVE PHOTOGRAPHS*** Negatives maintained by CHP. (9 photographs)

ROLL #	SOURCE	DATE	PHOTOGRAPHER	SUBJECT
165	Golden Gate MAIT	02/13/90	R. Linson # 9945	Photos of Cypress Street after completion of demolition and beginning of expressway. Negatives maintained by CHP. (25 photographs)

VIDEO TAPE LOG

Introduction

As part of this investigation, investigators screened hundreds of hours of video tape footage covering the documentation of the 1989 Loma Prieta Earthquake. The video footage viewed came from a number of sources, including, but not limited to: the media, public agencies, private sector businesses, and private citizens. The objective of this screening was to identify video footage of evidentiary value to the investigation, and documentation, of the collapse of the Cypress Street Viaduct and the San Francisco-Oakland Bay Bridge (SFOBB). The log presented below catalogues the video footage collected, or produced, by the California Highway Patrol (CHP) as part of its investigation. Video tapes produced by members of the CHP are available for purchase through the Oakland Area Office of the California Highway Patrol. Video tapes provided by public agencies, businesses, or private citizens are not available for purchase through this Department.

Tape No.	Source	Camera Person	Date(s)	Log No.
1	**California Highway Patrol**	Officer V. Chambers	10-18-89	10 *

Subject Description:

This tape shows video footage of earthquake damage to the city of Oakland and footage of the Emergency Operations Center (EOC) at the Cypress Structure. The tape also includes footage of the SFOBB. This tape is **available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
2	**California Highway Patrol**	Officer V. Chambers	10-18-89	33

Subject Description:

Aerial footage of the Cypress Structure taken from a CHP helicopter. The majority of the footage is out of focus and is generally of poor quality. This tape **is available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
3	**California Highway Patrol**	Officer B. Mc Auliffe	10-25 /11-2-89	12

Subject Description:

Aerial flights over the SFOBB and the Cypress Structure taken from a CHP helicopter. Video footage is intermixed with video of still photography showing sections of the SFOBB and Cypress Structure. Tape also includes video footage broadcast by KGO TV on 10-17-89, from 1740 to 1900 hours This tape also includes miscellaneous video footage aired by other Bay Area television stations. This tape Is **available** for purchase through the California Highway Patrol.

* The log numbers recorded here correspond to the original field investigation log number.

Tape No.	Source	Camera Person	Date(s)	Log No.
4	**California Highway Patrol**	Investigator C. Romano	10-28-89	n/a

Subject Description:

Ground level footage of the Cypress Structure. This tape focuses on the damage sustained by the structure, and documents portions of the upper deck, provides east and west side views of the structure, as well as views of the caps and columns along the structure. This tape is available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
5	**California Highway Patrol**	Investigator C. Romano	10-30-89	n/a

Subject Description:

Ground level footage of the Cypress Structure. This tape focuses on the damage sustained by the structure, and documents portions of the upper deck, provides east and west side views of the structure, as well as views of the caps and columns along the structure. This tape is available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
6	**California Highway Patrol**	Investigator G. Abshier	10-20,26-89	15

Subject Description:

Ground level footage of the Cypress Structure. This tape focuses on the damage sustained by the structure, and documents portions of the upper deck, provides east and west side views of the structure, as well as views of the caps and columns along the structure. This tape is available for purchase through the California Highway Patrol.

Tape No.	Source	Editor	Date(s)	Log No.
7	**California Highway Patrol**	Academy TV Services	n/a	n/a

Subject Description:

This tape is an edited version of tapes 4, 5 and 6, and includes views of the Cypress Structure from several other sources. The tape provides a sequential view of the structural damage to the Cypress Structure, from Bent 62 through Bent 112. This tape is available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
8	**California Highway Patrol**	Academy TV Services	10-24-89	16

Subject Description:

Ground level footage of the demolition of the Cypress Structure in the vicinity of Bent 26. This tape also includes aerial views of the Cypress Structure and SFOBB taken from a CHP helicopter. This tape **is available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
9	**California Highway Patrol**	Academy TV Services	10-24,26-89	17

Subject Description:

Ground level footage of the Cypress Structure. Miscellaneous footage of President Bush's visit to the Cypress Structure and the events surrounding that visit. This tape also includes aerial views of the Cypress Structure and SFOBB taken from a CHP helicopter. This tape **is available** for purchase through the California Highway Patrol.

Tape No.	Source	Editor	Date(s)	Log No.
10	**California Highway Patrol**	Academy TV Services	10-28-89	18

Subject Description:

"Earthquake Walking Tour". This tape was produced by the CHP Academy TV Services Unit for presentation by Golden Gate Division. This tape was produced and edited from video footage taken from tapes number 8 and 9, above. This tape **is available** for purchase through the California Highway Patrol.

Tape No.	Source	Editor	Date(s)	Log No.
11	**California Highway Patrol**	Academy TV Services	n/a	n/a

Subject Description:

"The Loma Prieta Earthquake." This is a video tape produced by the Academy TV Services from an edit of the video footage collected by the Department during its investigation of the collapse of the Cypress Stucture and the failure of the SFOBB closure spans. The tape provides an overview of the 1989 Loma Prieta Earthquake and its effect on these two structures. The tape also provides a summary of the Department's investigation of the earthquake induced collapse of the Cypress Street Viaduct and the failure of the two 50-foot closure spans of the San Francisco-Oakland Bay Bridge. This tape **is available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
12	**San Ramon Valley F.D.**	C. Bowen	10-18-89	19

Subject Description:

Ground level footage of the Cypress Structure taken by C. Bowen of the San Ramon Valley Fire Department. The objective of this tape was to summarize the rescue activities of the San Ramon Fire Department. This tape shows footage of the upper deck with vehicles still at the points of rest, and ground views of the Cypress Structure from West Grand Avenue to the distribution structure. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
13	**KRON TV - Channel 4**	Staff Photographers	10-89	20

Subject Description:

This tape includes broadcast and non-broadcast footage of KRON's camera coverage of the 1989 Loma Prieta Earthquake . Included in this tape are views of upper and lower deck rescue operations and miscellaneous interviews. The tape includes coverage of the rescue and interviews with the survivors of the . The tape also provides aerial views of the SFOBB and Cypress Street Viaduct. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
14	**KGO TV - Channel 7**	Staff Photographers	10-17-89	21

Subject Description:

This tape provides broadcast video footage and commentary aired by KGO on 10-17-89, from 1740 to 1900 hours. The tape includes early first day footage of the SFOBB and Cypress Structure. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
15	**KTVU - Channel 2**	Staff Photographers	10-17,18-89	22

Subject Description:

Ground level and aerial footage of the Cypress Structure. This tape provides newsroom and unaired footage of rescue operations and miscellaneous interviews being conducted at the Cypress Structure. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
16	**Network Affiliates**	Staff Photographers	10-17,20-89	23

Subject Description:

Recap of previously obtained video footage from various television stations. This tape includes footage of the Cypress Structure, the SFOBB, and includes interviews, rescue operations and anchor news coverage of the 1989 Loma Prieta Earthquake. The tape consists mostly of broadcast footage. This tape is **not available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
17	**KRON TV Channel 4**	Staff Photographers	10-17-89	24

Subject Description:

This tape provides first day aerial views of the SFOBB and Cypress Street Viaduct taken approximately 10 minutes after the earthquake struck. Shows the Dingee vehicle on fire (V-40). This tape also contains footage of the structure demolition and contains a segment of post earthquake structure collapse taken during the demolition process. This tape does not contain the original sound track. This tape consists mostly of un-aired footage taken by KRON photographers. This tape is **not available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
18	**KGO TV - ABC**	Staff Photographers	10-17-89	25

Subject Description:

Aerial views of the Cypress Structure and the SFOBB. Includes miscellaneous footage of the earthquake from other locations around the Greater Bay Area. This tape contains excellent first day footage of the Cypress Structure. It also includes copied material from tape number 14. This tape also includes segments of the fatal collision on the SFOBB taken by and includes footage of the rescue operations on the SFOBB. The original audio track is not included on this copy of the tape. This tape is **not available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
19	**California Highway Patrol**	Officer B. Mc Auliffe	n/a	26

Subject Description:

This tape provides video footage of the photographs taken of body extrication sites on the Cypress Structure by members of the United States Navy (USN) rescue team. These photographs, and the video footage produced from them, provides a graphic and sensitive depiction of the at-rest position of the bodies of victims found in, and extracated from, the Cypress Structure . This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
20	**Numerous**	Numerous	n/a	27

Subject Description:

This tape provides an accumulation of broadcast video footage and newsroom reports from various television stations throughout the Bay Area. This footage includes coverage of the SFOBB, the Cypress Structure, the Marina District, and other stories related to the earthquake and the damage it caused. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
21	**Numerous**	Numerous	n/a	28

Subject Description:

An accumulation of footage of the **SFOBB** collected by the CHP during its investigation. This tape contains copies of aired and un-aired media footage and is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
22	**Numerous**	Numerous	n/a	29

Subject Description:

An accumulation of footage of the **Cypress Structure** collected by the CHP during its investigation. This tape contains copies of aired and un-aired media footage and is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
23	California Highway Patrol	Officer B. Mc Auliffe	n/a	30

Subject Description:

This tape provides video footage of photographs collected from various sources by the CHP during its investigation. This footage includes photographs of both the Cypress Structure and the SFOBB, vehicle damage photographs, vehicle and body extraction photographs, and miscellaneous photographs related to the investigation and documentation of the Cypress Structure collapse and SFOBB closure span failure. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
24			10-17-89	31

Subject Description:

This tape is a copy of the home video taken by ' on the SFOBB depicting the fatal collision that occurred on the upper deck of the bridge. The tape also shows the post impact rescue efforts. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
25	California Highway Patrol	Officer B. Mc Auliffe	n/a	34

Subject Description:

This tape provides video footage of video and still photography collected from the Oakland Police and Fire Departments. This footage focuses on the upper deck of the structure and provides a close up look at the physical evidence located on the roadway surface, the damage the roadbed sustained, and shows upper deck vehicles at their points of rest prior to their removal. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
26	California Highway Patrol	Officer B. Mc Auliffe	n/a	35

Subject Description:

An accumulation of video footage borrowed from the Oakland Police and Fire Departments, the Alameda County Sheriff's Office, and the San Ramon Valley Fire Department by the CHP during its investigation. This tape is not available for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
27	**Alameda County S.O.**	Sgt. Reasoner	10-17,18-89	11

Subject Description:

This tape is a copy of the video footage taken by Sgt. Reasoner of the Alameda County Sheriff's Office. This video shows views of the upper and lower deck, and side views of the east and west sides of the Cypress Structure, from to the distribution structure, north of 32nd Street. The video was taken on 10-17 and 18 - 1989, and shows several of the involved vehicles at their respective points of rest. This tape is **not available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
28	**Oakland P.D.**	OPD Personnel	10-17,21-89	13

Subject Description:

This tape is a copy of the video footage of the extraction of lower deck victims taken by personnel from the Oakland Police Department. The footage shows body positions at their point of rest and depicts body removal. This tape is **not available** for purchase through the California Highway Patrol.

Tape No.	Source	Camera Person	Date(s)	Log No.
29	**Oakland P.D.**	OPD Personnel	10-18,19,89	14

Subject Description:

This tape is a copy of the video footage taken of the Cypress Structure by members of the Oakland Police Department. The tape depicts a ground level walk through of sections of the east and west side of the Cypress Structure. It also provides a walk through of sections of the upper deck, and shows a number of upper deck vehicles at their points of rest prior to removal from the structure. Also visible in this tape are marks, and other evidence, associated with upper deck vehicle motion. The tape also shows the extrication of V-37 (UCSF Transporter Van) from the upper deck. This tape is **not available** for purchase through the California Highway Patrol.

The audio tapes listed below were produced, or collected, by the California Highway Patrol during its investigation of the collapse of the Cypress Structure. These tapes are available for purchase through the Oakland Area Office of the California Highway Patrol.

TAPE #	DESCRIPTION
1	Interviews with D-47, D-26,
2	Interviews with D-31 D-45,
3	Interviews with P-26C, D-40,
4	Interviews with P-26D, D-14,
5	Interviews with D-48, D-3,
6	Interview with D-116,
7	Interviews with D-36, D-9,
8	Interviews with D-25, P-25A,
9	Interviews with D-29, D-15,
10	Interviews with D-46, P-46A,
11	Interview with P-1A,
12	Interview with D-13,
13	Interviews with D-5 D-4,
14	Interview with P-30a,
15	Interview with D-30,
16	Interviews with D-14, P-26B,
17	Interview with D-23,
18	Interviews with D-32, D-44,
19	Interview with D-115
20	Interview with D-109,
21	Interview with D-12,
22	Interview with D-17
23	Interviews with D-111, P-37A,

TAPE #	DESCRIPTION
24	Interview with D-39,
25	Interviews with D-95, D-38, .
26	Interview with D-94,
27	Interviews with D-35, D-49,
28	Interview with P-51A,
29	Interview with D-51,
30	Interviews with D-78, D-24,
31	Interview with P-30B,
32	Interviews with P-30D, P-30C,
33	Interviews with D-33, D-27,
34	Interview with D-74,
35	Interviews with D-21, P-21A, .
36	Interview with D-60,
37	Interviews with P-26A, P-18A,
38	Interview with D-88,
39	Interview with D-55,
40	Interview with D-10,
41	Interview with D-80,
42	Interview with D-82,
43	Interview with D-84,
44	Interviews with D-83, P-83A,
45	Interview with D-108
46	Interview with D-112,
47	Interview with P-107A,
48	Interviews with P-97A, D-97,

TAPE #	DESCRIPTION
49	Interviews with P-97D, ; P-97B,
50	Interview with D-114.
51	Interview with D-85,
52	Interviews with D-11, P-11A,
53	Interview with D-59
54	Interviews with D-41, D-20,
55	Interviews with D-19, P-19A,
56	Interview with D-71,
57	Interview with D-34,
58	Interviews with W-2, W-7,
59	Interview with W-32,
60	Interviews with W-24, W-21,
61	Interview with D-90,
62	Interview with D-2,
63	Interview with W-14,
64	Interviews with W-36, ; W-3,
65	Interview with W-23,
66	Interviews with W-10, W-43,
67	Interview with D-113,
68	Interview with D-58,
69	Interviews with W-33 W-56,
70	Interview with W-38,
71	Interview with W-52,
72	Interviews with D-42, and P-42A D-7
73	Interviews with W-31, W-25,

TAPE #	DESCRIPTION
74	Interview with D-70,
75	Interview with W-47,
76	Interview with W-13,
77	Interview with D-6,
78	Interview with W-1,
79	Interviews with W-20, W-55,
80	Interview with W-51,
81	Interviews with W-46, W-34,
82	Interview with W-40,
83	Interviews with W-53, W-48,
84	Interview with W-5,
85	Interviews with W-26, W-37,
86	Interview with W-35,
87	Interviews with W-29, W-39,
88	Interviews with W-45, W-27,
89	Interviews with W-49, W-6,
90	Interview with W-17,
91	Interview with W-15, W-16,
92	Interview with W-18,
93	Interview with W-4,
94	Interview with W-19,
95	Interview with D-43,
96	Interview with W-8,
97	Interview with W-50
98	Interview with D-110,
99	Interview with D-75,

TAPE #	DESCRIPTION
100	Interview with D-96,
101	Interview with W-44
102	Interview with W-11,
103	Interviews with W-30, W-42,
104	Interview with W-41,
105	Interviews with W-54, W-12,
106	Interview with D-18,
107	Interview with D-16,
108	Interviews with W-9, W-28,
109	Interview with W-22,
110	Interview with D-37,
111	Interview with D-107,
112	Interview with W-101,
113	Interviews with W-99, W-100,
114	CHP - San Francisco, Blue/Pink radio channels and 911 phone calls. 10/17/89, 1704 hours.
115	CHP - San Francisco, Blue/Pink radio channels and 911 phone calls. 10/17/89, 1704 hours.
116	CHP - Oakland, Gold/Tan/Purple radio channels. 10/17/89, 1642 to 1704 hours.
117	CHP - Oakland, Incoming 911 phone calls. 10/17/89, 1704 to 1709 hours.